BC hydro

Environmental Impact Assessment Report
Volume Two
Atlas

Kelly Lake to Cheekye Substation Second 500 kV Transmission Line

March 1991

Report No. ER-90-05

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to
Cheekye Substation
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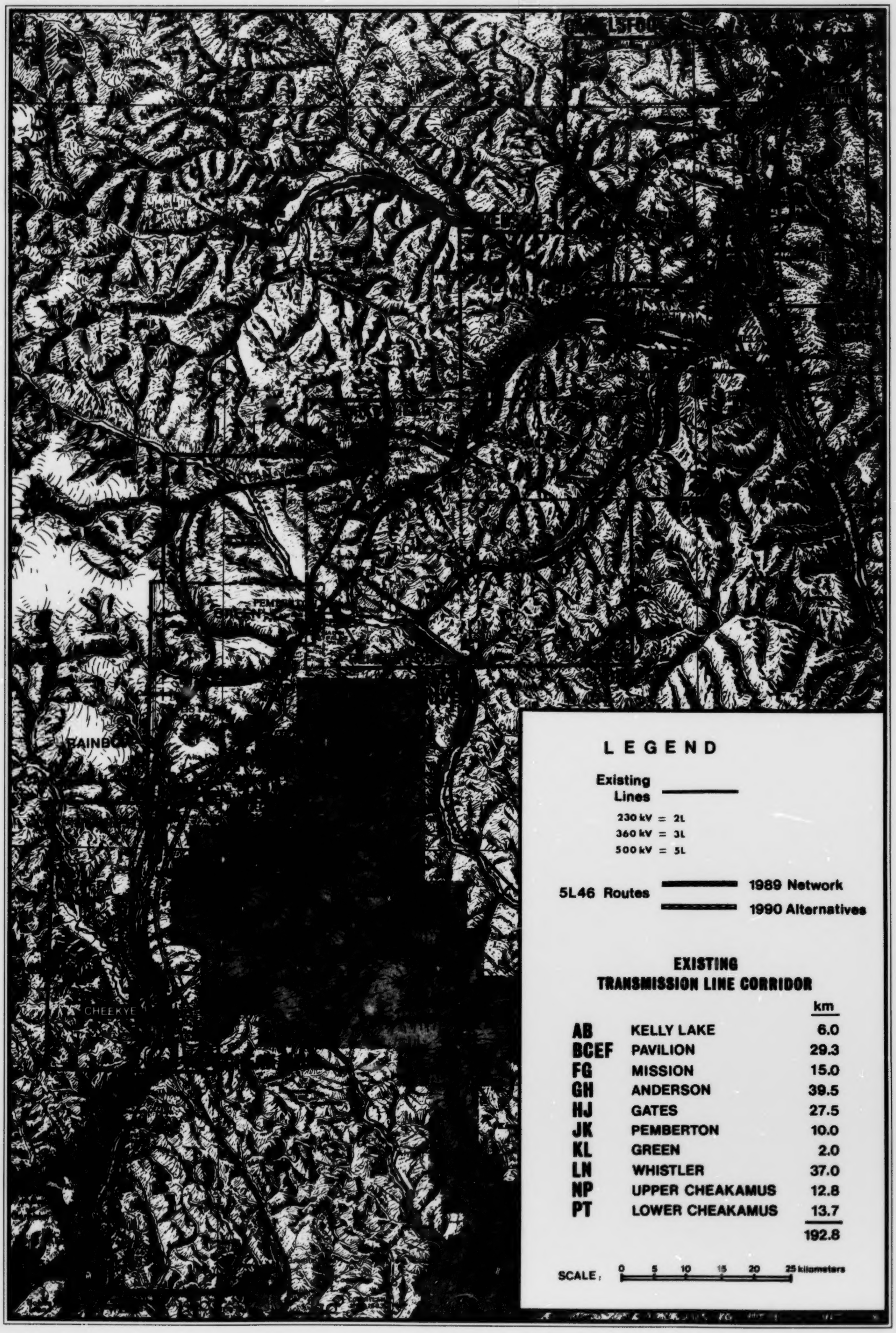
FIGURE A
(Foldout) →

FIGURE A: ROUTE NETWORK



ABBREVIATIONS

Alienated Land	Land not held by the Crown
ALR	Agricultural Land Reserve
ATV	All Terrain Vehicle
BC Rail	British Columbia Railway
BC Hydro	British Columbia Hydro and Power Authority
BEC	Biogeoclimatic Ecosystem Classification:
	AT - Alpine Tundra
	BG - Bunchgrass
	CWH - Coastal Western Hemlock
	IDF - Interior Douglas Fir
	ESSF - Englemann Spruce - Subalpine Fir
	MH - Mountain Hemlock
	MS - Montane Spruce
	PP - Ponderosa Pine
CLI	Canada Land Inventory
EPA	Environmental Protection Areas
ELUC	Environment and Land Use Committee
FL	Forest Licence
ha	Hectares
IR	Indian Reserve
km	Kilometres
kV	Kilo Volt
Lillooet	Village of Lillooet
l	Litres
m	Metres
MOE	Ministry of the Environment
MOF	Ministry of Forests
MOP	Ministry of Parks
Pavilion	Pavilion Village
Pemberton	Village of Pemberton
RAB	Resource Analysis Branch, Ministry of Environment
ROW	Right-of-Way
SLRD	Squamish-Lillooet Regional District
Squamish	Squamish District Municipality
TNRD	Thompson-Nicola Regional District
TSL	Timber Sales Licence
UREP	Reserved for the use, recreation and enjoyment of the public
WL	Woodlot Licence
Whistler	The Resort Municipality of Whistler

CONTENTS

ABBREVIATIONS iv
INTRODUCTION vii
  EXISTING TRANSMISSION SYSTEM vii
  MAP SHEETS vii
  ROUTE NETWORK DESIGNATION viii
  1989 NETWORK viii
    Kelly Lake (AB) viii
    Pavilion (BCEF) viii
    Antoine (BG) viii
    Mission (FG) xi
    Duffey (FJ) xi
    Anderson (GH) xi
    Birkenhead (HI) xi
    Gates (HJ) xi
    Owl (IK) xi
    Ryan (IM) xi
    Pemberton (JK) xi
    Green (KL) xi
    Soo (LM) xi
    Whistler (LN) xi
    Rainbow (MN) xi
    Upper Cheakamus (NP) xi
    Lower Cheakamus (PQRT) xi
  1990 ALTERNATIVES xi
    Ore (UV) xi
    Bridge (F1X) xi
    East Pavilion (WW1DE) xi
    South Pavilion (W1F1) xii
    Seton Suboption (G1G2) xii
    D'Arcy Suboption (H1H2) xii
    Lokla Suboption xii
    Function Suboption (Y1Y) xii
    Callaghan (N1Y1) xii
    High Cheakamus (YZT) xii
    Pinecrest (Y1N2P1) xii
  IMPACT POTENTIAL SUMMARY xii
  STUDY PARTICIPANTS xii
  REFERENCES xii

I TERRAIN

  METHODOLOGY 1
  IMPACT POTENTIAL ASSESSMENT 1
    Access Roads 1
    Impact Potential Ratings 2
  1989 NETWORK 2
    Kelly Lake (AB) 2
    Pavilion (BCEF) 2
    Fraser (CDE) Suboption 3
    Antoine (BG) 3
    Mission (FG) 3
    Duffey (FJ) 4
    Anderson (GH) 5
    Birkenhead (HI) 5
    Gates (HJ) 5
    Owl (IK) 6
    Ryan (IM) 6
    Pemberton (JK) 6
    Green (KL) 7
    Soo (LM) 7
    Whistler (LN) 7
    Rainbow (MN) 8
    Upper Cheakamus (NP) 8
    Lower Cheakamus (PQRT) 8
  1990 ALTERNATIVES 9
    Ore (UV) 9
    Bridge (F1X) 9
    East Pavilion (WW1DE) 9
    South Pavilion (W1F1) 9
    Seton (H1H2) Suboption 9
    D'Arcy (H1H2) Suboption 10
    Lokla Suboption 10
    Function (Y1Y) Suboption 10
    Callaghan (N1Y2) 10
    High Cheakamus (YZT) 10
    Pinecrest (Y1N2P1) 10
  REFERENCES 10
  MAP SERIES I 11-31

II LAND USE AND AGRICULTURE

  LAND USE 33
    North Sector 33
    South Sector 33
    Local Government 33
    Native People 33
    Economic Development 34
    Impact Potential Assessment 34
  AGRICULTURE 34
    Impact Potential Rating 34
  1989 NETWORK 36
    Kelly Lake (AB) 36
    Pavilion (BCEF) 36
    Fraser (CDE) Suboption 37
    Antoine (BG) 37
    Mission (FG) 37
    Duffey (FJ) 38
    Anderson (GH) 38
    Birkenhead (HI) 39
    Gates (HJ) 39
    Owl (IK) 39
    Ryan (IM) 40
    Pemberton (JK) 40
    Green (KL) 40
    Soo (LM) 40
    Whistler (LN) 40
    Rainbow (MN) 41
    Upper Cheakamus (NP) 41
    Lower Cheakamus (PQRT) 41
  1990 ALTERNATIVES 42
    Ore (UV) 42
    Bridge (F1X) 42
    East Pavilion (WW1DE) 42
    South Pavilion (W1F1) 43
    Seton (G1G2) Suboption 43
    D'Arcy (H1H2) Suboption 43
    Lokla Suboption 43
    Function (Y1Y) Suboption 43
    Callaghan (N1Y2) 44
    High Cheakamus (YZT) 44
    Pinecrest (Y1N2P1) 44
  MAP SERIES II 47-67

III VEGETATION AND FORESTRY

  ASSESSMENT 69
  IMPACT POTENTIAL RATINGS 69
    Vegetation 69
    Forestry 70
  BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION 70
  1989 NETWORK 70
    Kelly Lake (AB) 70
    Pavilion (BCEF) 71
    Antoine (BG) 71
    Mission (FG) 72
    Duffey (FJ) 72
    Anderson (GH) 73
    Birkenhead (HI) 74
    Gates (HJ) 74
    Owl (IK) 74
    Ryan (IM) 75

    Pemberton (JK) 75
    Green (KL) 75
    Soo (LM) 76
    Whistler (LN) 76
    Rainbow (MN) 76
    Upper Cheakamus (NP) 76
    Lower Cheakamus (PQRT) 77
  1990 ALTERNATIVES 77
    Ore (UV) 77
    Bridge (F1X) 77
    East Pavilion (WW1DE) 77
    South Pavilion (W1F1) 77
    Seton (G1G2) Suboption 77
    D'Arcy (H1H2) Suboption 78
    Lokla Suboption 78
    Function (Y1Y) Suboption 78
    Callaghan (N1Y2) 78
    High Cheakamus (YZT) 78
    Pinecrest (Y1N2P1) 78
  REFERENCES 78
  MAP SERIES III 79-99

IV FISH AND WILDLIFE

WILDLIFE 101
  Impact Potential Assessment 101
FISH 102
  Benthic Fauna 102
  Anadromous Fish 102
  Sport Fishing 102
  Native Food Fisheries 103
  Methodology 103
  Impact Potential Assessment 103
1989 NETWORK 103
  Kelly Lake (AB) 103
  Pavilion (BCEF) 103
  Antoine (BG) 104
  Mission (FG) 104
  Duffey (FJ) 104
  Anderson (GH) 105
  Birkenhead (HI) 105
  Gates (HJ) 105
  Owl (IK) 106
  Ryan (IM) 106
  Pemberton (JK) 106
  Green (KL) 106
  Soo (LM) 107
  Whistler (LN) 107
  Rainbow (MN) 107
  Upper Cheakamus (NP) 107
  Lower Cheakamus (PQRT) 108
1990 ALTERNATIVES 108
  Ore (UV) 108
  Bridge (F1X) 108
  East Pavilion (WW1DE) 108
  South Pavilion (W1F1) 108
  Seton (G1G2) Suboption 109
  D'Arcy (H1H2) Suboption 109
  Lokla Suboption 109
  Function (Y1Y) Suboption 109
  Callaghan (N1Y2) 109
  High Cheakamus (YZT) 109
  Pinecrest (Y1N2P1) 109
REFERENCES 110
LIST OF CONTACTS 110
MAP SERIES IV 111-131

V RECREATION AND AESTHETICS

MAJOR ATTRACTIONS 133
IMPACT ASSESSMENT 135
1989 NETWORK 135
  Kelly Lake (AB) 135
  Pavilion (BCEF) 135
  Antoine (BG) 136
  Mission (FG) 136
  Duffey (FJ) 136
  Anderson (GH) 137
  Birkenhead (HI) 138
  Gates (HJ) 138
  Owl (IK) 139
  Ryan (IM) 139
  Pemberton (JK) 139
  Green (KL) 140
  Soo (LM) 140
  Whistler (LN) 140
  Rainbow (MN) 142
  Upper Cheakamus (NP) 142
  Lower Cheakamus (PQRT) 143
1990 ALTERNATIVES 144
  Ore (UV) 144
  Bridge (F1X) 144
  East Pavilion (WW1DE) & South Pavilion (W1F1) 144
  Seton (G1G2) Suboption 145
  D'Arcy (H1H2) Suboption 145
  Lokla Suboption 145
  Function (Y1Y) Suboption 145
  Callaghan (N1Y2) 145
  High Cheakamus (YZT) 145
  Pinecrest (Y1N2P1) 146
REFERENCES 146
MAP SERIES V 147-167

VI HERITAGE

ETHNOGRAPHY 169
  Shuswap 169
  Lillooet 169
  Squamish 170
HISTORIC SUMMARY 170
METHODOLOGY 170
ASSESSMENT 170
  Site Evaluation 171
  Impact Potential Ratings 171
1989 NETWORK 171
  Kelly Lake (AB) 171
  Pavilion (BCEF) 172
  Fraser (CDE) Suboption 173
  Antoine (BG) 174
  Mission (FG) 175
  Duffey (FJ) 175
  Anderson (GH) 176
  Birkenhead (HI) and Owl (IK) 176
  Gates (HJ) 177
  Ryan (IM) 177
  Pemberton (JK) 177
  Green (KL) 177
  Soo (LM) and Rainbow (MN) 177
  Whistler (LN) and Upper Cheakamus (NP) 177
  Lower Cheakamus (PQRT) 177
1990 ALTERNATIVES 178
  Ore (UV) 178
  Bridge (F1X) 178
  East (WW1DE) and South (W1F1) Pavilion 179
  Seton (G1G2) Suboption 179
  D'Arcy (H1H2) Suboption 179
  Lokla Suboption 179
  Function (Y1Y) Suboption 179
  Callaghan (N1Y2) 179
  High Cheakamus (YZT) 179
  Pinecrest (Y1N2P1) 180
REFERENCES 180
MAP SERIES VI 181-201

FIGURES

A ROUTE NETWORK iii
B TOWER CONFIGURATION vii
II-1 SHALALTH/SETON PORTAGE DEVELOPMENT POTENTIAL 45
II-2 PEMBERTON AREA PROPOSED DEVELOPMENT 45
II-3 ROUTING IN ALPHA/NITA LAKES AREA 45
II-4 SOUTH WHISTLER/McGUIRE AREA PROPOSED ROUTING 45
III-1 BIOGEOCLIMATIC UNITS IN RELATION TO ELEVATION AND DISTANCE INLAND 71
VI-1 SALISHAN LINGUISTIC GROUPS 169

TABLES

A OVERALL IMPACT POTENTIAL SUMMARY xiii
II-1 TYPICAL AGRICULTURAL IMPACTS 35
V-1 STUDY AREA PROVINCIAL PARKS 134
V-2 IMPACT POTENTIAL RATING DERIVATION GUIDELINES 135

INTRODUCTION

BC Hydro proposes to construct a second 500 kV single circuit transmission line from the Kelly Lake substation (Photo A) west of Clinton to the Cheekye substation north of Squamish. This line (designated as 5L46) has been contemplated for over a decade and its purpose is to reinforce the transmission system between Kelly Lake and the Lower Mainland and Vancouver Island.

5L46 is scheduled to be in-service in the mid-1990s. The line will consist of three electrical phases (conductors) on lattice steel towers typically spaced at 300-500 m intervals. The towers will be either the traditional flat configuration or the taller delta configuration (Figure B); maximum tower height is 53 m and the ROW requirement is approximately 70 m in width.

The direct distance from Kelly Lake to Cheekye via the existing transmission line corridor is 193 km in which the transition is made from the Interior Plateau to the Pacific Coast, through the Coast Mountains. Kelly Lake is situated in the south-western portion of the Interior Plateau which has a dry climate with hot summers and cold winters; typical vegetation is open Ponderosa pine forest and bunchgrass. Cheekye is located at the head of Howe Sound which has a mild, wet coastal climate with moderate summers and cool, wet winters; the predominant vegetation is Douglas-fir and hemlock forest with dense underbrush.

Earlier studies on this project were completed in 1981 and 1984 (Sigma, 1981; Cypress, 1984). This environmental study and impact assessment and the resource information in this atlas build on the knowledge gained then and from further studies carried out in 1989 and 1990 covering an expanded route network.

EXISTING TRANSMISSION SYSTEM

The Kelly Lake and Nicola substations are important points in BC Hydro's transmission system. They receive electrical energy generated in the north and east of the province and distribute it to the major substations in the Lower Mainland and on Vancouver Island. Two 500 kV lines (5L41 and 5L42) and two 230 kV lines (2L90 and 2L91) leave Kelly Lake for the south, and run in a common corridor to Pavilion. Here 5L42 turns west, crosses the Fraser and heads for Cheekye using the corridor established by the early transmission lines south from the Bridge River generating station; 5L41 continues south in the Fraser Canyon outside the

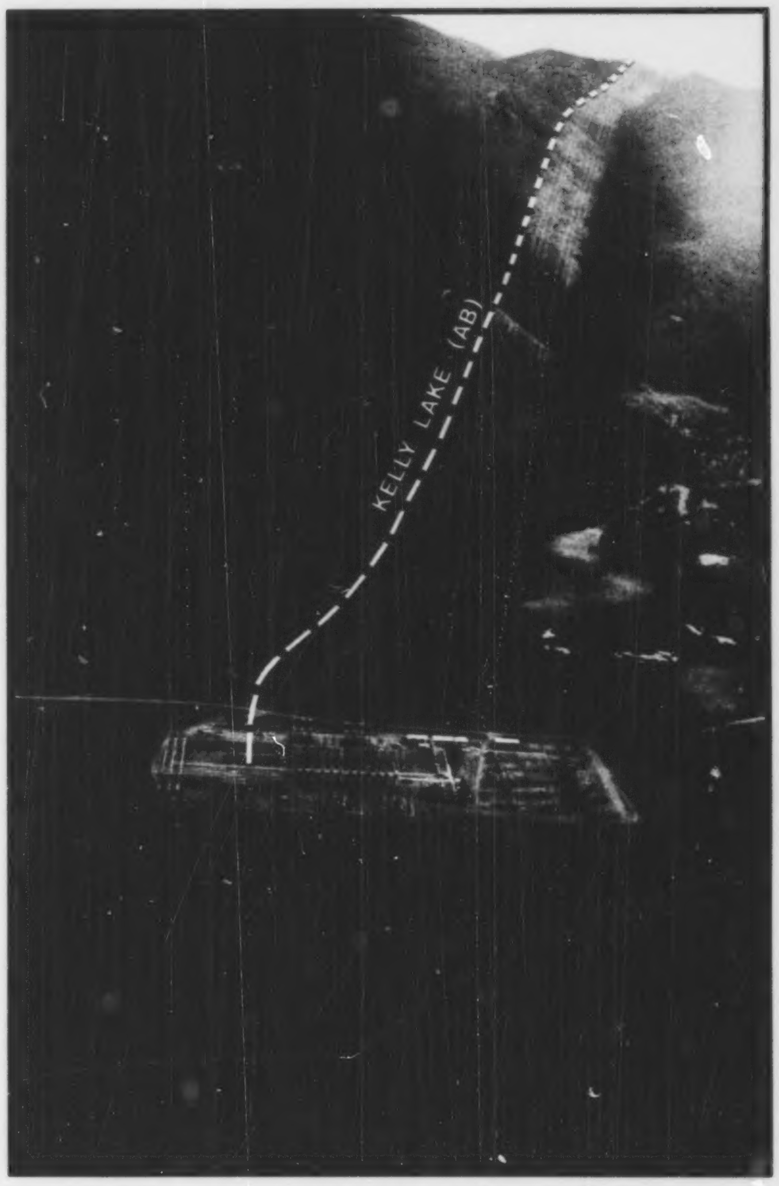
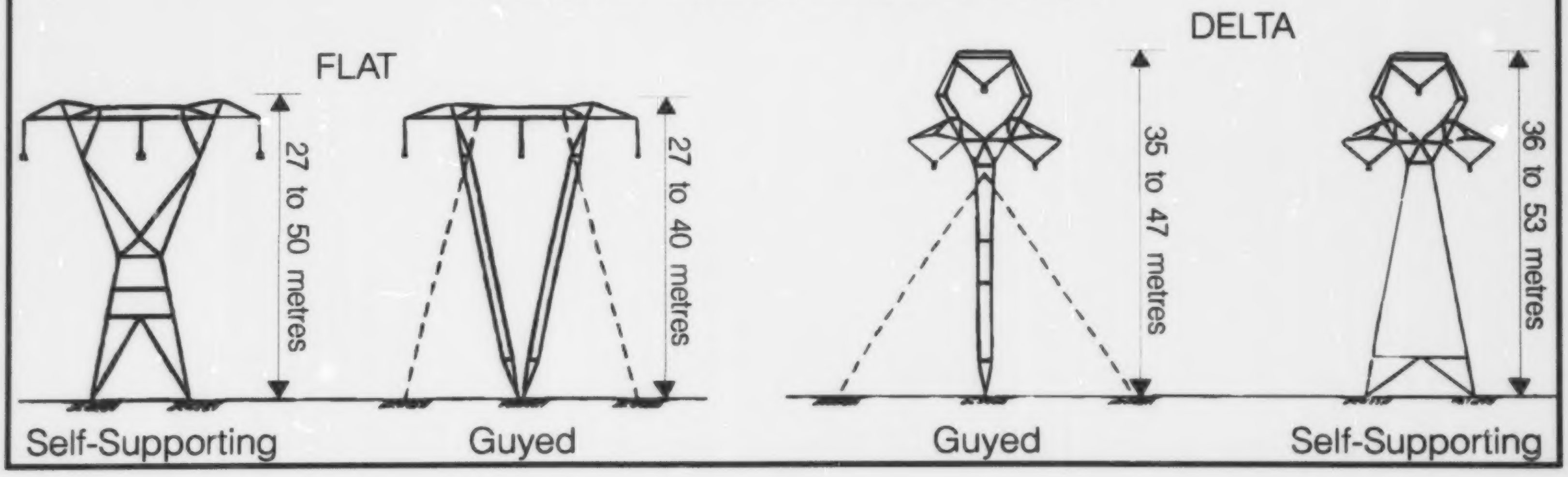


PHOTO A: Kelly Lake substation near Clinton, where 5L46 would utilize an existing unused ROW (I) on the east side of 5L41/5L42.

FIGURE B: TOWER CONFIGURATION



Study Area. 2L90/2L91 continue to follow the Fraser River south, turning west at Lillooet to traverse the south side of Seton Lake and terminate at the Shalalth substation.

Two 230 kV lines (2L1/2L2) and one 360 kV line (3L2) start south from Shalalth: 2L1/2L2 terminate at Cheekye; and 3L2 leaves 2L1/2L2 near Mount Currie and follows the valley of the Lillooet River south. If the project proceeds, BC Hydro will remove 2L1 from the Bridge River generating station at Shalalth to the Rainbow substation near Green Lake. The removal of 2L1 between Rainbow and Cheekye will be determined by the routing south of the Soo River (Photo B): if the Whistler/Cheakamus valley corridor is selected, then 2L1 will be removed and portions of its ROW would be utilized for 5L46; on the other hand, if Whistler is bypassed to the west by way of the Soo/Rainbow/Callaghan/High Cheakamus routing, then 2L1 may remain in place south of Rainbow substation to provide service flexibility to Whistler.

Another 230 kV line (2L12) connects the Cheakamus generating station in the Squamish Valley to the Cheekye substation. From Cheekye, 5L30 and 5L32 transmit power to Vancouver Island, 5L45 to Meridian substation in Coquitlam, and 2L13 and 2L19 to substations in North and West Vancouver.

MAP SHEETS

Ten base map sheets at 1:50,000 scale have been utilized to include all of the route alternatives (Figure A, p. iii). Each sheet covers a total of 1,000 square km; after allowance for overlapping of the sheets, the total area covered by the ten map sheets is approximately 7,000 square km (the Study Area). The maps presented in this atlas have been reduced to 1:100,000 scale for ease of use.

This atlas contains six map series which describe the Study Area's resources. The topics in each of the series are: I. TERRAIN; II. LAND USE and AGRICULTURE; III. VEGETATION and FORESTRY; IV. FISH and WILDLIFE; V. RECREATION and AESTHETICS; and VI. HERITAGE. Each map series contain ten sequential sheets, numbered from Kelly Lake to Cheekye. Each map sheet has been assigned a number, and a name which reflects its geographic locality as follows:

1 West	CAMELSFOOT - Fraser River west to the Yalakom River.
1 East	FRASER RIVER - Kelly Lake south to Fountain.
2	BRIDGE RIVER - Kelly Lake south to Lillooet and west to Moha.
3	CAYOOSH - Carpenter Lake south to Cayoosh Creek and west to Seton Portage.
4 North	ANDERSON - Carpenter Lake south to Cayoosh Creek and west to D'Arcy.
4 South	DUFFEY - Extension of 4 North to south of Duffey Lake.
5	GATES RIVER - Birkenhead Lake Park south to Mount Currie and west to Pemberton.
6	PEMBERTON VALLEY - Ryan River south to Green Lake.
7	WHISTLER - Pemberton south to Daisy Lake.
8	CHEAKAMUS - Daisy Lake south to Squamish.

Consequently there are a total of sixty maps in this atlas. The map sheet designations reflect both the resource series (ie. Terrain) and the particular location (ie. Fraser River): for example, the Terrain information in the vicinity of the Fraser River from Kelly Lake to Fountain can be found on Map I-1 East.

ROUTE NETWORK DESIGNATION

The route network, within which a final route from Kelly Lake to Cheekye must be found, is shown on Figure A. Each of the route alternatives is defined by node letters, and a geographic name (eg. Anderson (GH)). A network of seventeen segments and four suboptions (the 1989 Network) was studied between June 1989 and April 1990. After a program of public consultation the 1989 Network was expanded in June 1990 to include twelve additional alternatives (the 1990 Alternatives, seven segments and five suboptions). The complete route network is as follows:

Segment	Suboption	Nodes	Distance (km)
1989 Network			
Kelly Lake		AB	6.0
Pavilion		BCEF	29.3
	Fraser	CDE	5.8
Antoine		BG	44.3
Mission		FG	15.0
Duffey		FJ	89.0
Anderson		GH	39.5
Birkenhead		HI	20.0
Gates		HJ	27.5
Owl		IK	25.0
Ryan		IM	57.0
Pemberton		JK	10.0
Green		KL	2.0
Soo		LM	18.0
Whistler		LN	37.0
Rainbow		MN	23.0
Upper Cheakamus		NP	12.8
Lower Cheakamus		PQRT	13.7
	West	PR	10.0
	East	QS	10.0
	South	RST	6.1
1990 Alternatives			
Ore		UV	38.0
Bridge		F1X	19.7
East Pavilion		WW1DE	11.8
South Pavilion		W1F1	8.5
	Seton	G1G2	5.5
	D'Arcy	H1H2	13.5
	Lokla		1.0
	Function	Y1Y	3.3
Callaghan		N1Y2	6.7
High Cheakamus		YZT	36.6
Pinecrest		Y1N2P1	21.6
	East	Y1YN2	6.3

1989 NETWORK

This section briefly describes the location and general characteristics of the 1989 Network segments and suboptions.

KELLY LAKE (AB) - 6.0 KM

Segment AB runs south from the Kelly Lake substation (Photo A, p. vii) on an existing unoccupied ROW, adjacent to the east side of 5L41/5L42 to the junction point for the Pavilion and Antoine segments at Node B. From the Kelly Creek valley, the route climbs the west flank of Pavilion Mountain to an elevation of almost 1700 m. Segment AB is entirely within the dry Interior ecosystem.

PAVILION (BCEF) - 29.3 KM

Segment BCEF runs south from node B to the mouth of the Bridge River near Fountain. The route continues on the unoccupied ROW east of the existing transmission lines (5L41/5L42 2L90/2L91) for 13 km over the Diamond S ranch rangelands on Pavilion Mountain to node C on Pavilion IR. South of node C there are two alternative Fraser River crossings (Photo C, p. x): CD which follows 5L42 directly across the Fraser; and CDE, the 5.8 km Fraser suboption, which follows the other three lines down the east side of the river for an additional 1.5 km before turning west to cross the Fraser to node E. From node E south to the Bridge River (10 km) the route follows 5L42 on the eastern flank of the Camelsfoot Range. Segment BCEF lies entirely within the Interior ecosystem.

ANTOINE (BG) - 44.3 KM

Segment BG runs westerly for 7 km from node B to Cavanagh Creek which it then follows in a south-westerly direction down to cross the Fraser River near the creek mouth. From the Fraser, the route rises in a westerly direction for 15 km to cross the Camelsfoot Range near Slok Hill at an elevation of over 1800 m. From Slok Hill, segment BG follows the Antoine Creek valley for 9 km to its confluence with the Bridge River near Moha at elevation 520 m. After crossing the Bridge River (Photo D, p. x), the route rises in a southerly direction for another 9 km to meet 5L42 on Mission Ridge. Apart from sub-alpine sections on Mission Ridge, segment BG lies entirely in the Interior ecosystem.

MISSION (FG) - 15.0 KM

Segment FG ascends the northern slope of Mission Ridge adjacent to the south side of 5L42 (Photo E, p. x). It begins on the west

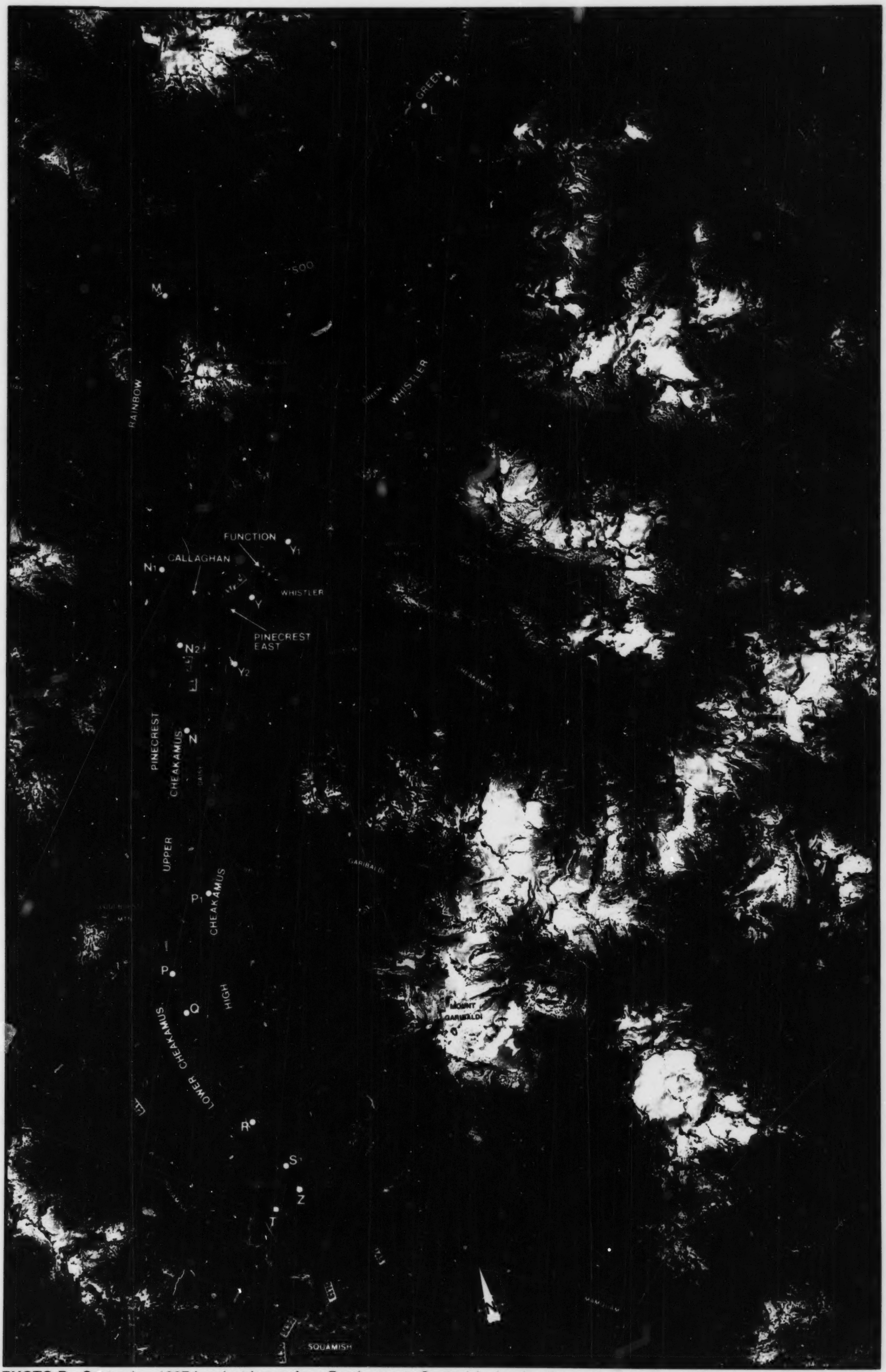


PHOTO B: September 1987 Landsat Image from Pemberton to Squamish showing the route alternatives either through Whistler or to the west via the Soo River and Rainbow pass and the subsequent alternatives south to the Cheekye substation.

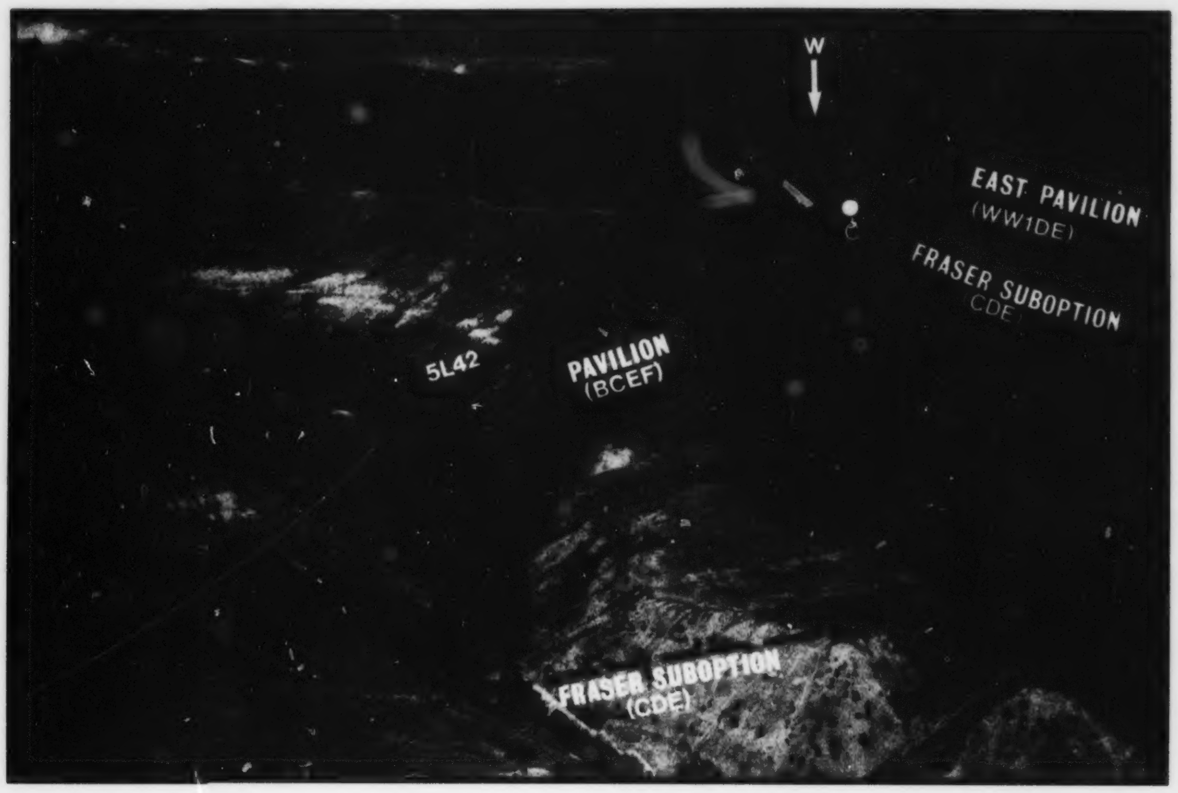


PHOTO C: Interior Plateau looking north-east across the Fraser River towards Pavilion IR1 and the Diamond S Ranch. The CE section of the Pavilion (BCEF) segment and the CDE suboption are two possible Fraser River crossings.

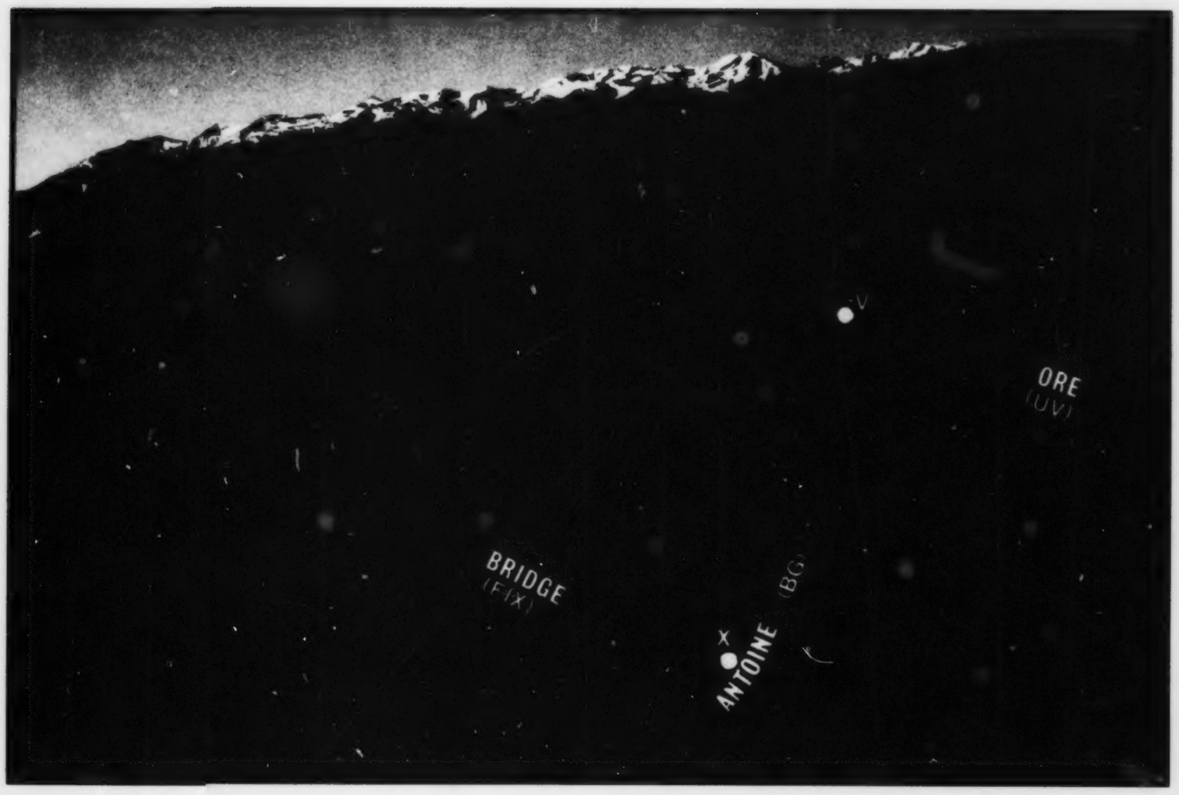


PHOTO D: Looking south over the Bridge River valley at the west end of Bridge River IR1. The Bridge (F1X) and Ore (UV) segments meet the Antoine (BG) segment near the Yalakom River.

PHOTO E: Looking northeast near Mission Pass where the Anderson (GH) route is on the south side of 5L42. At almost elevation 2000 m this area is among the highest in the entire route network.

bank of the Bridge River and traverses in a westerly direction to the junction with segment BG. Ama and Moon creeks are two significant Bridge River tributaries which are crossed in the first 6 km. Apart from the portion near the Bridge River, segment FG lies in the sub-alpine and alpine zones.

DUFFEY (FJ) - 89.0 KM

Segment FJ extends from the Bridge River to Mount Currie via Lillooet (Photo F, p. xiv) and the valleys of Cayoosh and Joffre creeks. It follows 2L90/2L91 from node F for 11 km to the east end of Seton Lake, from where it uses an entirely new route south-west for 64 km following the Duffey Lake Road to Lillooet Lake at the mouth of Joffre Creek. The final 14 km are in a north-westerly direction adjacent to the north side of 3L2 through the Mount Currie area to node J at the Creekside capacitor station. Segment FJ makes the transition between the dry Interior and wet Coastal ecosystems.

ANDERSON (GH) - 39.5 KM

Segment GH descends from node G on Mission Ridge for 14 km to Seton Portage at the head of Anderson Lake adjacent to 5L42. One km west of Seton Portage the route descends to use the 2L1 ROW, crossing 2L2 and 3L2 on the way. At the south end of Anderson Lake (Photo G, p. xiv), the route diverges from 2L1 to lie adjacent to 3L2 to node H near the confluence of Blackwater Creek and the Gates River. Segment GH traverses the transition zone between the Interior and Coastal ecosystems.

BIRKENHEAD (HI) - 20.0 KM

Segment HI follows the Blackwater Creek valley for 12 km from node H to the north end of Birkenhead Lake. It then turns in a south-westerly direction to run along the entire east side of Birkenhead Lake for 8 km to node I near the junction of Tenas Creek and the Birkenhead River. Much of the Blackwater Valley has been recently developed for agriculture while the route follows a sidehill along the east side of Birkenhead Lake (Photo H, p. xiv). Segment HI is in the transition zone between the Interior and Coastal ecosystems.

GATES (HJ) - 27.5 KM

Segment HJ follows the Gates and Birkenhead river valleys to the Creekside capacitor station (Photo I, p. xvi) near Mount Currie. The corridor is already heavily utilized by the BC Rail line, four transmission lines (5L42, 3L2, 2L1 and 2L2) and the Pemberton-D'Arcy Road. The route would use new ROW from D'Arcy to Pemberton Pass and the 2L1 ROW from Pemberton Pass to Creekside (14 km). Segment HJ is also in the transition zone between the Interior and Coastal ecosystems.

OWL (IK) - 25.0 KM

Segment IK rises from approximately 850 elevation m (Photo G, p. xv) to cross the sub-alpine areas of Fowl and Owl creeks at an elevation of almost 1600 m near the mid-point of its length. It then descends to cross the Pemberton Valley and Lillooet River before traversing its final 5 km to node K near Nairn Falls Provincial Park immediately south of Pemberton. Segment IK is virtually all in the Coastal ecosystem.

RYAN (IM) - 57.0 KM

Segment IM rises up the Tenas Creek Valley from the south end of Birkenhead Lake (Photo H, p. xv), crosses the ridge at almost elevation 2,000 m before dropping down to the Pemberton Valley near Wolverine Creek. The route crosses the Pemberton Valley at approximately elevation 275 m before ascending Ryan Creek in a westerly direction for 9 km then turning south through a tributary valley to crest a pass into the Rutherford Creek. Segment IM then descends Rutherford Creek to the first acceptable pass into the Soo Valley which it crosses before descending again to meet the Soo Segment at node M (Photo K, p. xvi). Segment IM lies predominately within the Coastal ecosystem.

PEMBERTON (JK) - 10.0 KM

Segment JK follows the existing corridor south from Creekside. It uses the 2L1 ROW for the first 5 km but at the Lillooet River the route diverges to lie adjacent to the north side of 5L42 to node K. It crosses the bench north of Pemberton and the Lillooet River and Pemberton Valley (Photo J, p. xvi) before rising over Signal Hill (elevation 450 m) and descending down again to Nairn Falls on the Green River. Segment JK is entirely within the Coastal ecosystem.

GREEN (KL) - 2.0 KM

Segment KL, the shortest in the entire route network, traverses a sidehill east of the Green River (Photo J, p. xvi) to node L approximately 1 km east of the Tisdall substation; it lies entirely within the Coastal ecosystem.

SOO (LM) - 18.0 KM

Segment LM crosses the Green River and crests a ridge at approximately elevation 1000 m in a south-westerly direction to descend into the Soo River Valley. Ten km from node L the route turns west to follow the south side of the Soo for 8 km to node M (Photo K, p. xvi). Segment LM is in the Coastal ecosystem.

WHISTLER (LN) - 37.0 KM

Segment LN follows the existing major travel corridor of the Green and Cheakamus river valleys from node L adjacent to the Tisdall substation through Whistler (photo M, p. xvii) to the head of the Daisy Lake reservoir. In general the route uses the 2L1 ROW through Whistler to the west side of Alta Lake from where it diverges from the 2L1 ROW for 10 km to node N. Segment LN is in the Coastal ecosystem.

RAINBOW (MN) - 23.0 KM

Segment MN runs south from the Soo River over a pass (Photo K, p. xv) at approximately elevation 1,350 m on the west side of Rainbow Mountain; it then traverses the wide expanse of the lower Callaghan River valley (Photo M, p. xvii) to join the transmission line corridor at the head of Daisy Lake. Segment MN is in the Coastal ecosystem in an area which has present and future tourism potential including Rainbow and Callaghan mountains.

UPPER CHEAKAMUS (NP) - 12.8 KM

Segment NP utilizes the 2L1 ROW for 9 km south from node P to the head of the Cheakamus Canyon (Photo B, p. ix). It then moves to the west side of the valley for 4 km to node P near Butterfly Lake. Segment NP is in the Coastal ecosystem.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

With the exception of the first 2 km south of node P, all of segment PQRT utilizes the 2L1 ROW. There are three Lower Cheakamus suboptions (Photo N, p. xvii): PR, which traverses the west side of the valley for 10 km south of node P; QS is a 10 km suboption on the east side of the river; and RST is a 6.1 km suboption from node R to the east of the 2L1 ROW. Segment PQRT and its suboptions are in the Coastal ecosystem.

1990 ALTERNATIVES

This section briefly describes the location and general characteristics of the 1990 Alternatives.

ORE (UV) SEGMENT - 38.0 KM

Segment UV is a 38.0 km western alternative to the mid-section of the Antoine (BG) segment. It begins on the plateau 3 km west of the Fraser River leaving segment BG at node U, from where it traverses the Camelsfoot Range in a westerly direction for 20 km. It turns to a south-westerly heading around Mount Birch at approximately elevation 1900 m and follows the Ore Creek drainage for 7 km down to elevation 700 m at the Yalakom River. One km past the Yalakom crossing, the route turns to a south-easterly heading to follow the west bank of the Yalakom for 6 km; it then crosses the Bridge River and continues for 4 km to node V on segment BG, located 3 km south of the Bridge River (Photo D). Segment UV is entirely within the dry Interior ecosystem.

BRIDGE (F1X) SEGMENT - 19.7 KM

Segment F1X is a 19.7 km southern connector from the Pavilion (BCEF) segment on the west side of the Fraser to the Antoine (BG) segment at its crossing of the Bridge River. It begins at node F1 near the intersection of Blackhill Creek and the 5L42 ROW. The route follows the North Blackhill Creek drainage in a north-westerly direction for 4 km before turning west at approximately elevation 1800 m. It then traverses the Camelsfoot Range, crossing Applespring Creek at 9 km, then turning first to the west-south-west for 3 km and then north-west along rugged, undulating terrain above the Bridge River to join segment BG near the confluence of Antoine Creek and the Bridge River (Photo D). Segment F1X is entirely within the dry Interior ecosystem.

EAST PAVILION (WW1DE) SEGMENT - 11.8 KM

Segment WW1DE by-passes Pavilion Indian IR1 to the east and south (Photo C). The route leaves the Pavilion (BCEF) segment 2 km south of Gillon Creek and traverses in a southerly direction for 4 km before turning in a south-westerly direction for 3 km to node D on the Fraser (CDE) suboption. It then follows the suboption route (node D to E) to cross the Fraser diverging slightly to join segment BCEF near Lee Creek, from where the route has the option of joining either of segments F1X or BCEF. Segment WW1DE is located entirely within the dry Interior ecosystem.

SOUTH PAVILION (W1F1) SEGMENT - 8.5 KM

Segment W1F1 leaves segment WW1DE at node W on a hillside east of Pavilion and traverses to the south-west for 7 km across the benchlands east of the Fraser before crossing the river and rising sharply to Blackhill Creek on the Pavilion (BCEF) segment. It is located entirely within the dry Interior ecosystem.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton (G1G2) suboption of the Anderson (GH) segment utilizes steep terrain north of the narrow strip of land between Seton and Anderson lakes to bypass Seton Lake IR 5A. The route climbs the hillside for 2.5 km in a south-westerly direction to an elevation of approximately 1100 m before descending on a south-south-west heading for 3.5 km to the 2L1 ROW on the shore of Anderson Lake. The Seton suboption is in the transition zone between the dry Interior and moist Coastal ecosystems.

D'ARCY (H1H2) SUBOPTION -13.5 KM

Suboption (H1H2) bypasses the native lands and other settlements near node H at the junction of the Anderson (GH), Birkenhead (HI), and Gates (HJ) segments. It links segments GH and HJ by means of a crossing of Anderson Lake 2.5 km from the south end of the lake (Photo G, p. xiv). The route leaves the 2L1 ROW (upon which segment GH is aligned) in a southerly direction for 5 km to a turning point at John Creek. The route then is aligned in a south-westerly direction to join segment HJ on a hillside 1 km south of the Gates River. The D'Arcy suboption is in the transition zone between the dry Interior and moist Coastal ecosystems.

LOKLA SUBOPTION - 1.0 KM

The Lokla suboption of the Gates (HJ) segment is a very short diversion to the east around Lokla IR 4 approximately 2 km north of Creekside. The Lokla suboption is in the transition zone between the dry Interior and moist Coastal ecosystems.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

The Function (Y1Y) suboption of the Whistler (LN) segment diverts around the development area at Function Junction 2 km south-west of Whistler (Photo L, p. xvi). The route uses the 2L1 ROW for 1.5 km from its departure from segment LN before turning south-west to cross Highway 99 and the BC Rail line to rejoin segment LN at node Y. The Function suboption is in the moist Coastal ecosystem.

CALLAGHAN (N1Y2) SEGMENT - 6.7 KM

Segment N1Y2 is a comparatively short connection from the lower Callaghan Valley on the Rainbow (MN) segment to the High Cheakamus (YZT) segment (Photo M, p. xvi). It departs segment MN, 8 km north of node N, and follows a side hill in a south-easterly direction for 3 km. It then crosses 2L1, 2L2, 5L42, Highway 99, and the BC Rail line in the Cheakamus Valley, before turning to a southerly heading and ascending for the final 2 km to node Y2. Segment N1Y2 is entirely in the moist Coastal ecosystem.

HIGH CHEAKAMUS (YZT) SEGMENT - 36.6 KM

Segment YZT leaves the Whistler (LN) segment in a south-south-westerly direction, passes to the east of Daisy Lake and follows the east side of 5L42 from 1 km south of Rubble Creek for most of the remaining 23 km to Cheekye (Photo B, p. ix). Segment YZT is mainly on undulating hillsides sloping toward the Cheakamus Valley south of Daisy Lake. A number of drainages are crossed including (from north to south) Marble, Rubble, Conroy, Culliton and Swift creeks and the Brohm River. Elevations along the route vary from approximately 900 m near Marble Creek down to almost sea-level at Cheekye. Segment YZT is in the moist Coastal ecosystem.

PINECREST (Y1N2P1) SEGMENT - 21.6 KM

The Pinecrest (Y1N2P1) segment is an alternative to the northern half of the High Cheakamus (YZT) segment, following the west side of the Cheakamus River valley (Photo L, p. xvi). From node Y1, in the vicinity of Function Junction, the route parallels 2L1/2L2 for 8.2 km, following Highway 99. An eastern suboption (Y1YN2), begins at node Y1 and follows 5L42 south for 6.3 km passing through node Y, before crossing 2L1/2L2 and rejoining the Pinecrest segment at node N2. The route then travels in a southerly direction to the west of Pinecrest Lake, then joins and runs adjacent to 5L42 immediately south of Daisy Lake for 2 km, at which point it terminates at node P1, on the eastern side of the valley. Segment Y1N2P1 is entirely within the moist coastal ecosystem.

IMPACT POTENTIAL SUMMARY

The resource impact potential from the construction and maintenance of 5L46 in each of the route alternatives was assessed in this study. Each of the ten resource disciplines (Terrain, Land Use, Agriculture, Vegetation, Forestry, Fish, Wildlife, Recreation, Aesthetics and Heritage) defined criteria to rate impact potential as either negligible, low, moderate, high or, severe. The criteria for each discipline is specific to that resource and cannot be assumed as equal between disciplines. No attempt has been made to estimate cumulative impact potential for each of the route alternatives because of the unequal nature of the resources disciplines. Table A simply summarizes the highlighted impact potential statements given in this document.

STUDY PARTICIPANTS

The information in this document has been condensed from the reports (Hatfield, Juan de Fuca, Points West, Talisman, and Urban Systems, 1990) of an interdisciplinary team co-ordinated by Ken Farquharson, P.Eng., consultant to BC Hydro's Environmental Resources Division. Editorial production and graphics were carried out by Talisman Land Resource Consultants of Vancouver, B.C. The participants are:

- **Terrain**: Paul Christie, P.Ag., R.P.Bio., and Jace Standish R.P.F., P.Ag. of Talisman.
- **Land-Use**: John Dumbrell, M.A., and Gordon Petersen, M.C.I.P., of Urban Systems Ltd., Kamloops, B.C.
- **Agriculture**: David Huxley, P.Ag., and Paul Christie of Talisman.
- **Vegetation and Forestry**: Karen Christie, B.Sc., of Talisman, and Jace Standish.
- **Fish**: Geoffrey Smith, B.Sc. (Bio.), of Hatfield Consultants Limited, West Vancouver, B.C.
- **Wildlife:** Wayne Biggs, P.Ag., R.P.Bio., of Westland Resource Group, Victoria, B.C.
- **Recreation and Aesthetics**: Don Benn, R.P. Bio., of Juan de Fuca Environmental Consultants, Victoria, B.C.
- **Heritage**: Jean Bussey, M.A., of Points West Heritage Consulting Ltd., Langley, B.C.

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Sigma Resource Consultants, Kelly Lake/Cheekye Transmission Line Stage 1. Environmental Studies, 1981.

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TABLE A
KELLY LAKE TO CHEEKYE OVERALL IMPACT POTENTIAL SUMMARY

ROUTE ALTERNATIVE	NODES	TERRAIN	LAND USE	AGRICULTURE	VEGETATION	FORESTRY	WILDLIFE	FISH	RECREATION	AESTHETICS	HERITAGE
KELLY LAKE	(AB)	L	N-L	L	L-M	L-M	M	L(st)	L	L	H
PAVILION	(BCEF)	L-M	L	M	M	L	M	L(st)	L	L	H
FRASER SUB	(CDE)	M-H	N	M	M-H	L	M	N	L	S	H
ANTOINE	(BG)	H	H	L-M	M-H	M	H	M	M	H	H
MISSION	(FG)	L-M	L	N-L	M	L-M	L	L(st)	L	L	M
DUFFEY	(FJ)	H	H	L	M-H	M-H	H	L-M(st)	H	S	H
ANDERSON	(GH)	L-M	L	N-L	M	L-M	N-L	L(st)	L	M	H
BIRKENHEAD	(HI)	L-M	L	N-L	M-H	M	M	L(st)	S	S	L
GATES	(HJ)	L	L	N-L	L-M	L-M	M	L(st)	L	M	L
OWL	(IK)	H	M	L	H	M	M	L(st)	S	S	L
RYAN	(IM)	M-H	L	L-M	H	M-H	H	L(st)	S	S	L
PEMBERTON	(JK)	L	L	L	L	L-M	L	L(st)	M	L	N
GREEN	(KL)	L	N	N	M	L	N	N	L	L	N
SOO	(LM)	M-H	L	N	M-H	H	M-H	L(st)	M	M	L
WHISTLER	(LN)	L	L	N	L-M	M	L-M	L(st)	L	M	L
RAINBOW	(MN)	M	H	N	H	H	M	L(st)	H	H	L
UPPER CHEAKAMUS	(NP)	L-M	L	N	L	L	L	L(st)	L	H	L
LOWER CHEAKAMUS	(PQRT)	L	L	L	L	L	L	L(st)	L	H	L
* WEST SUB	(PR)	L	L	N	M	M-H	L	L(st)	L	S	L
* EAST SUB	(QS)	L	L	N	M	M-H	L	L(st)	H	S	M
* SOUTH SUB	(RST)	L	L	N-L	M	L-M	L	L(st)	L	M	M
ORE	(UV)	H	M	N-L	M-H	M-H	H	L(st)	L	H	H
BRIDGE	(F1X)	H	L	N-L	M-H	L	H	L(st)	H	S	M
EAST PAVILION	(WW1DE)	M	L	M	M-H	L	M	L(st)	M	S	H
SOUTH PAVILION	(W1F1)	M-H	L	L-M	M-H	L	M	N	M	S	H
SETON SUB	(G1G2)	H	N	N	M	L-M	L-M	L(st)	L	L	L
D'ARCY SUB	(H1H2)	L-M	H	N	M	L-M	M	L(st)	L	S	M
LOKLA SUB		L	N	N	L-M	N	N-L	L(st)	L	L	M
FUNCTION SUB	(Y1Y)	L	N	N	L-M	N	N-L	L(st)	L	M	L
CALLAGHAN	(N1Y2)	L-M	M	N	L-M	H	M	L(st)	M	H	L
HIGH CHEAKAMUS	(Y1ZT)	L-M	L	N	L-M	M	L	L(st)	H	M	L
PINECREST	(Y1N2P1)	L	L	N	L-M	M	N-L	L(st)	M-H	M-H	L
PINECREST EAST SUB	(Y1YN2)	L	L	N	L	L	N-L	L(st)	M-H	M-H	L

* NOTE: This table lists the overall potential impacts as stated by the consultants and is provided for information purposes only. Because impact potential cannot be assumed to be equal, there is no tabulation of cumulative impact potential for each route alternative. Definitions of impact potential criteria can be found in each of the resource chapters.

N =	Negligible impact potential
L =	Low impact potential
M =	Moderate impact potential
H =	High impact potential
S =	Severe impact potential (Recreation and Aesthetics only)
st =	Short term impacts

PHOTO F: Looking south over Lillooet where the Duffey (FJ) segment would be adjacent to the 2L90/2L91 ROW to the east end of Seton Lake.

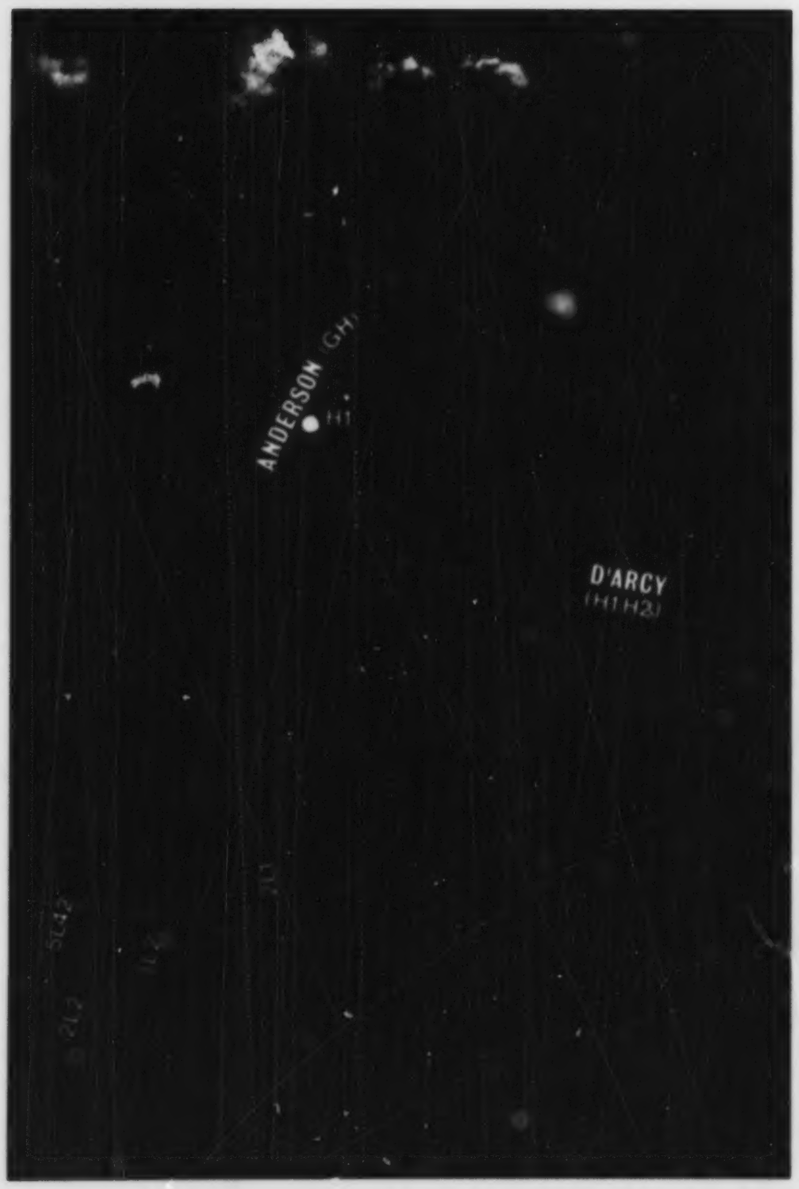

PHOTO G: Looking north along Anderson Lake from above D'Arcy (foreground) where the D'Arcy (H1H2) suboption is an alternative to the Anderson (GH) segment.

PHOTO H: Looking south-west at south end of Birkenhead Lake (foreground) where the Ryan (IM) and Owl (IK) segments diverge from node I.

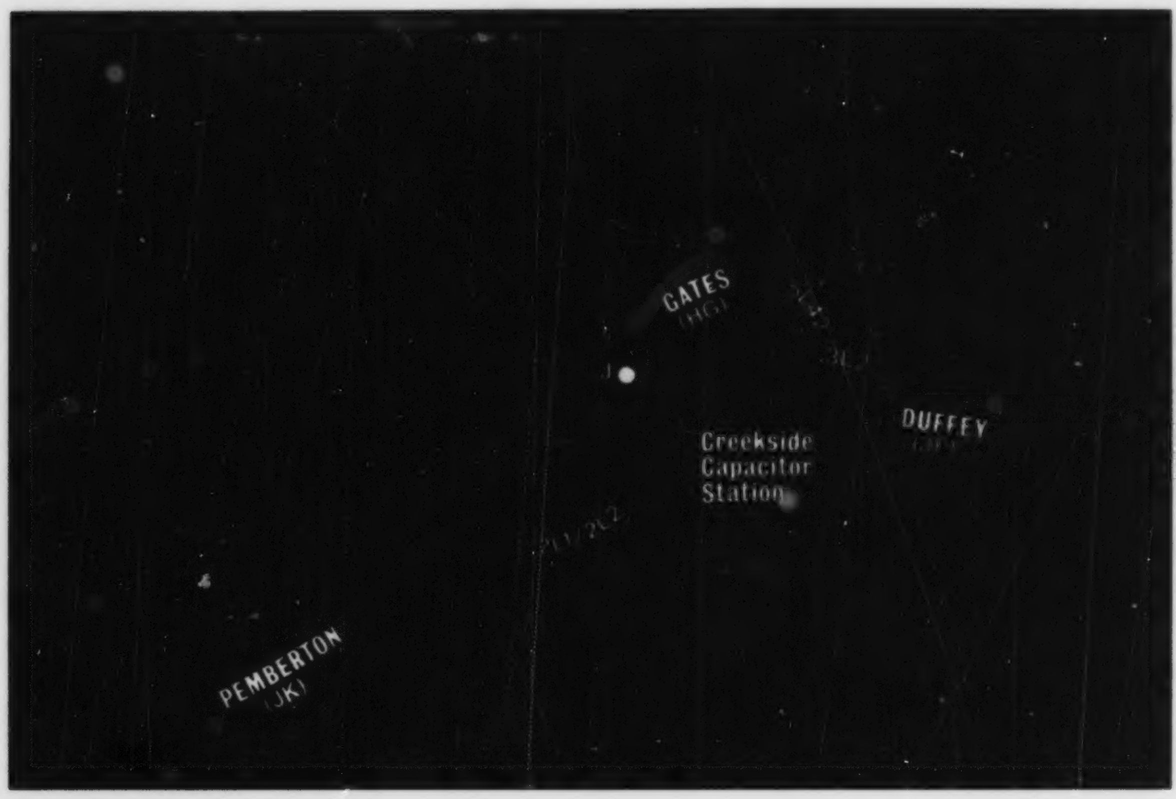

PHOTO I: Looking north up the Birkenhead River valley over the Creekside Capacitor Station. The Gates (HJ), Duffey (FJ), and Pemberton (JK) segments meet at node J.

PHOTO J: Looking south-west over the Pemberton Valley at Pemberton towards the Green River and the Soo River valley (right background). The Whistler (LN) segment continues south from node L.

PHOTO K: Looking west down the Soo River valley with its extensive wetlands. The Rainbow (MN) segment (left background) is the western route alternative to the Whistler/ Squamish corridor.

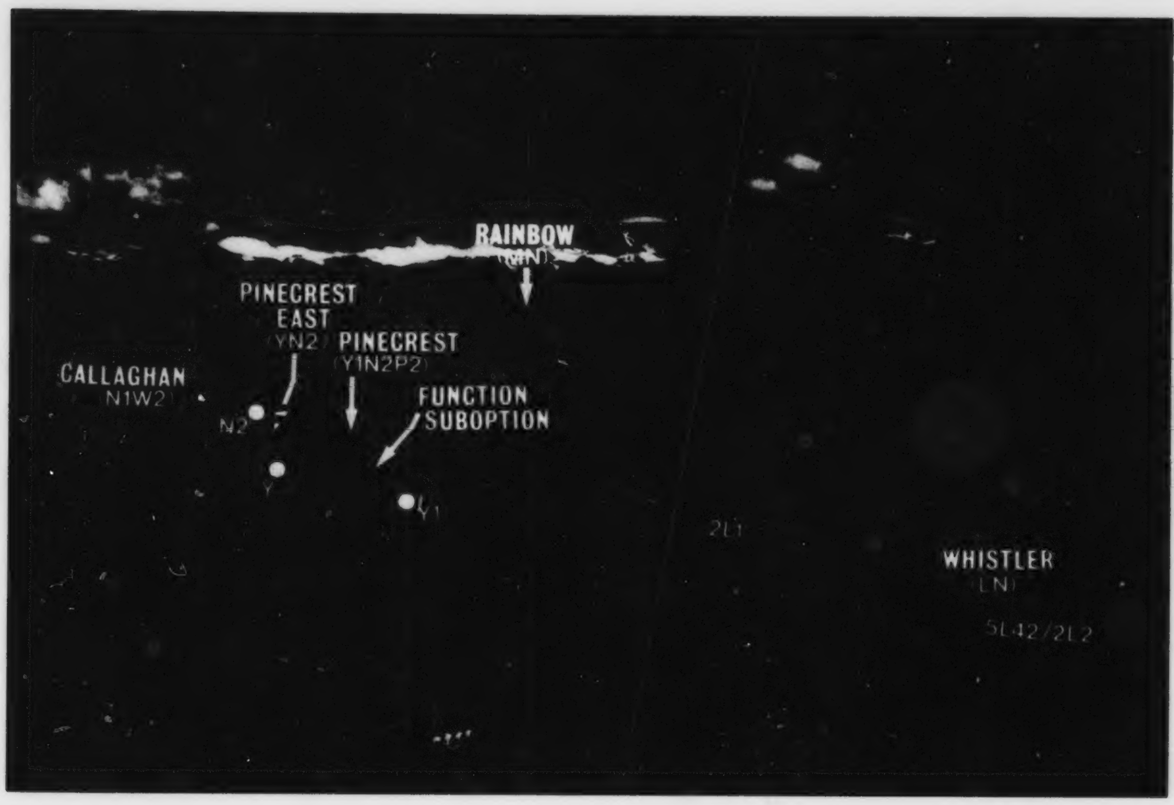

PHOTO L: Looking south-west over Whistler from Blackcomb Mountain. Alta Lake is in the right foreground and Function Junction and the Callaghan Valley are in the background.

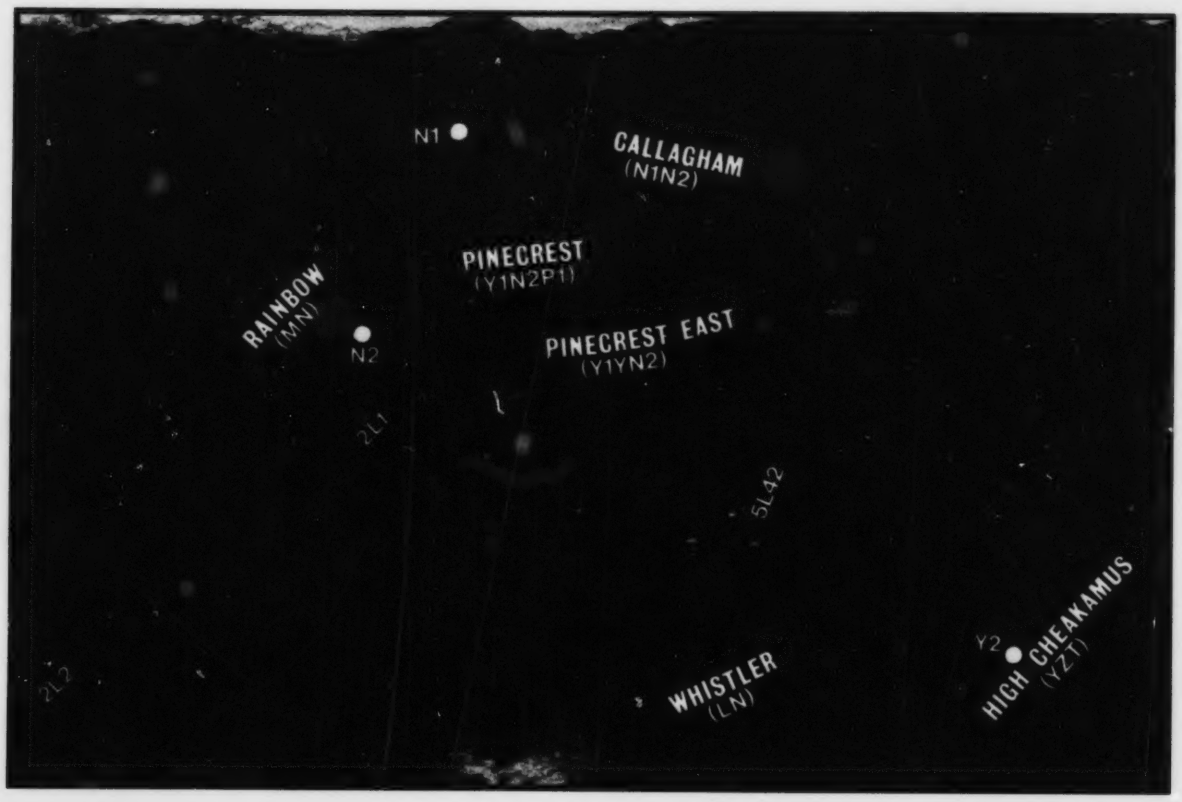

PHOTO M: Looking north into the Callaghan River valley from above Daisy Lake (foreground) showing the route alternatives north of the Cheakamus Canyon.

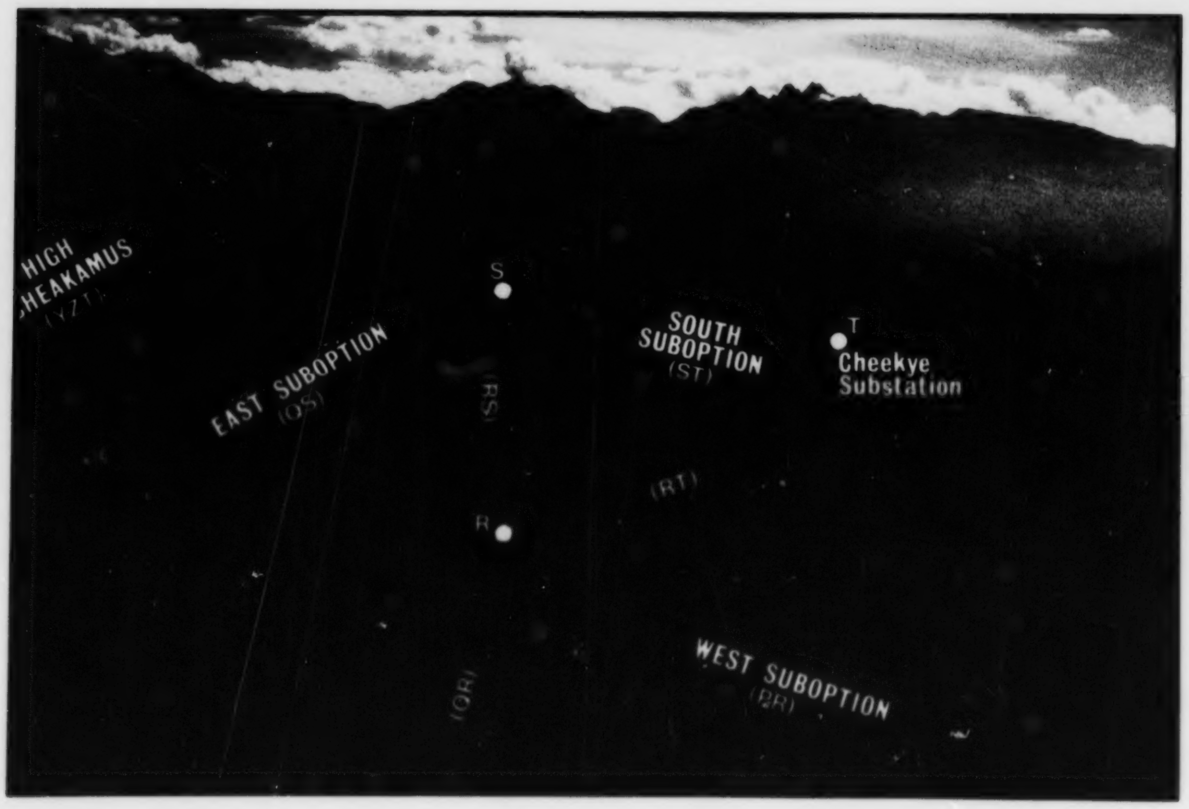

PHOTO N: Looking south in the Lower Cheakamus River valley to Cheekye substation (node T) showing all of the Lower Cheakamus route options and the High Cheakamus (YZT) segment.

I
TERRAIN

The terrain assessments of 1981 and 1984 were expanded to include all of the route alternatives. Relevant published, mapped, and written information was incorporated into the analysis and new mapping and terrain hazard and impact potential interpretations have been provided for the entire network. The terrain assessment has been carried out from an environmental perspective reflecting potential adverse impacts of line construction and maintenance on biophysical resources; it does not consider the geotechnical feasibility of transmission line construction and maintenance.

METHODOLOGY

Very little published terrain/soils information exists for the Study Area. The soils and landform maps available are:

- 1:50,000 scale Terrain and Soils Map, NTS sheet 92I/13, which includes the area from the confluence of the Bridge and Fraser rivers north to Kelly Lake; it covers the route alternatives in the vicinity of Pavilion on the east side of the Fraser as it only extends approximately 8 km west of the Fraser;
- 1:50,000 scale Terrain Map, NTS sheet 92G/14, 1980, Resource Analysis Branch (RAB), Ministry of the Environment (MOE), covering that portion of the Study Area from Cheekye to Daisy Lake; and
- 1:20,000 scale soil maps from the Soil Survey of the Pemberton Valley, British Columbia, RAB Bulletin 16 (1980), covering the Pemberton Valley with soils mapping presented on air photo mosaics.

For routes within these areas, the existing mapping was used for the terrain assessment with some modifications resulting from information collected during the field investigations. For the remainder of the Study Area, where no published information was available, the analysis was based on air photo interpretation and/or air reconnaissance and a limited field program. Air photo interpretation, using a combination of black and white aerial photographs (1:10,000 to 1:70,000 scale) and 1:10,000 scale colour photographs taken in 1982, 1986 and 1989, was used for the terrain mapping. Detailed site investigations of terrain and soil conditions and laboratory analyses of surficial materials were not undertaken, but may be necessary to design control measures on sensitive sites.

Terrain units were pre-typed using a 2-8 power stereoscope, prior to field investigations. When finalized following the field investigation program, the terrain units were transferred from the aerial photographs to the base map sheets. The classification and terminology used for the terrain mapping was adopted from the provincial Terrain Classification System (ELUC Secretariat, 1978). The report by J.M. Ryder and B. McLean, Guide to the Preparation of a Geological Hazards Map (RAB, 1980), provided the framework for the terrain hazards analysis.

The field work was undertaken during the summer and fall periods of 1982, 1989, and 1990, using both ground vehicle and helicopter; helicopter reconnaissance only was utilized for reviewing the 1990 Alternatives. The field investigations included the evaluation of factors potentially affecting the type and magnitude of potential terrain impacts; site investigations varied in scope but generally included the following factors:

- Topography - slopes were measured using a clinometer;
- Surficial materials - the genetic materials were identified by road cuts, natural embankments, and from shallow, hand excavations;
- Texture - hand texturing of the surficial materials was done for each distinct strata, and the percent and size of coarse fragments were visually estimated;
- Drainage - conditions were evaluated according to the classification system outlined in Describing Ecosystems in the Field (RAB, Technical Paper 2, 1980);
- Soil classification - classified according to The Canadian System of Soil Classification (Agriculture Canada, 1978);
- Bedrock geology - major bedrock types were identified where possible; and
- Unique features - any unique features such as bedrock outcrops, talus deposits, existing erosion patterns, surface ponding, seepage, and apparent instability, were noted.

IMPACT POTENTIAL ASSESSMENT

Terrain impact potential associated with transmission line construction and maintenance can result from four major activities: ROW clearing; access road construction; tower foundation construction; and maintenance of the line, particularly use of access roads and drainage changes resulting from road construction and use. Associated impacts include:

- fine-textured material erosion in disturbed areas;
- dry ravel of coarse-textured materials on disturbed, steep slopes and along cutbanks;
- gullying and mass wasting or other failures in fine-textured soils along access roads, primarily along steep cutbanks;
- gullying and washouts caused by runoff concentration in disturbed areas, or along roads where natural drainage paths have been disrupted;
- slope failures due to clearing and/or excessively steep cutbanks along access roads; and
- compaction of fine-textured soils resulting in deep rutting and puddling.

ACCESS ROADS

The degree to which access road construction may result in impacts on terrain depends on the availability of existing access roads, and the geological hazards and limitations associated with terrain units where new road construction may be required. Many of the route alternatives do not require further road access as they follow existing transmission lines (i.e. along Anderson Lake and north of Pavilion). In other areas, linear road access may exist within a segment, but the nature of adjacent terrain may prohibit construction of access to the tower locations, such as in the Cayoosh Creek canyon where numerous avalanche chutes and scree slopes occur. If access roads are necessary within these sensitive areas where no access currently exists, high terrain impacts may result.

The assessments assume that where 5L46 uses an existing unoccupied ROW (such as on Pavilion Mountain) or where it replaces 2L1, terrain impacts associated with access road construction have already occurred and that additional impacts would be minimal because existing access would be used. Where new roads may be required to access an existing ROW, this has been taken into consideration. Where the route is adjacent to an existing transmission line, (such as over Mission Ridge), it is assumed that the existing access network would be utilized, but with the addition of spur roads to the new tower locations. For route alternatives either on a new ROW or in an existing transmission corridor but separated from existing lines, it is assumed that a new access road system would be required.

IMPACT POTENTIAL RATINGS

Terrain units were assigned low, moderate, or high impact potential ratings, based on the following criteria:

- Low - assigned to terrain features where the impact potential of transmission line construction and maintenance is considered to be minor. Using standard construction methods, slope failures or erosion would be minor and confined to the ROW, and standard soil conservation and terrain stabilization practices would be sufficient to mitigate most impacts.
- Moderate - assigned where there is no visible evidence of terrain instability. However, the topography and nature of the surficial deposits or bedrock indicates that transmission line construction may cause significant slope failures and/or erosion which might extend beyond the ROW. The impacts may be controlled by special engineering measures.
- High - assigned to units where evidence of existing hazards indicates the terrain is unstable. Instability usually occurs where loose surficial deposits occur on a steep slope, jointing and faulting in the bedrock lies parallel or nearly parallel to a steep slope, or where erodible surficial deposits (generally fine-textured) comprising a steep slope are subject to saturation or concentrated water flows. In the Study Area, these conditions are often indicated by the presence of debris slides, rock slides, talus deposits, organic soil deposits, and erosion gully networks. Snow and debris avalanche chutes are also considered to be high impact potential sites. In high impact potential areas and/or where geologic hazards occur, transmission line construction without careful route and tower/access site selection and extensive mitigation planning is likely to result in a significant increase in the occurrence of major slope failures and erosion, the effects of which may extend beyond the width of the ROW.

1989 NETWORK

KELLY LAKE (AB) - 6.0 KM

Between Kelly Lake and the Fraser River near Pavilion, the Kelly Lake (AB) segment crosses the Marble Range. The major bedrock formation comprising the high peaks and ridges along major drainage features is limestone.

Kelly Lake substation lies at an elevation of almost 1100 m and is located on an alluvial fan at the confluence of Gabriel and Kelly creeks, comprised of well-drained, gravelly, sandy deposits, with level to 5% slopes. Near the substation the route crosses stable, level to moderately sloping floodplain and fan deposits of Cutoff Creek. The route then rises steeply to the upper slopes of the Marble Range, to an elevation of almost 1700 m, along the northwest flank of Pavilion Mountain. Streams crossing segment AB in this section are deeply incised into the extremely deep, stony, coarse-textured morainal and colluvial deposits which mask bedrock ridges at varying depth, with occasional exposure of the bedrock. Steeper slopes typically vary between 30-60%, with isolated slopes as steep as 80%. Cutbanks and gullies along the access road servicing the existing transmission line ROW show evidence of erosion and failure and there is some active rockfall and colluvial deposition on the slopes above the ROW.

The deeply incised gullies present moderate-high impact potential during construction, due to the existing slope failure areas and susceptibility to further erosion. If existing access roads are used and additional access needs are minimal, potential impacts in addition to those that are already present should be minimal. Mitigation of existing impacts would require reduction of access road cutbank slopes, recontouring of the crests of cutbanks, and timely revegetation.

Provided that the above mentioned precautionary conditions are followed, the overall terrain impact potential of segment AB is judged to be low.

PAVILION (BCEF) - 29.3 KM

On the south side of Hambrook Creek, the Pavilion (BCEF) segment enters a high plateau lying between elevation 1100-1460 m, which slopes gently to the southwest. The surficial materials of the plateau consist of deep, medium to moderately fine-textured morainal deposits. The topography is complex and kettled with numerous seasonal, small ponds, shallow surface streams, and shallow depressions and gullies. The surface texture of the morainal soils varies from silty clay loam to loam. Towards the Fraser River the morainal deposits become shallower and the topography is more influenced by bedrock. In the vicinity of node C, although the surficial materials are essentially the same, erosion along the Fraser and Pavilion rivers has increased the slopes to between 40-50%.

On gentler slopes, impact potential along segment BCEF is moderate due to the susceptibility of the silty morainal material to compact under machinery loads; on steeper terrain, especially where gullying and other forms of soil erosion are evident, potential impacts are high because of the possibility of exacerbating these problems with more disturbance due to additional access road construction. If the existing access roads can be used to a great extent with little additional access road construction, further impacts other than those already occurring would be minimal. For existing areas of compaction and where erosion is evident along access roads, particularly within the Pavilion IR, alleviation of surface compaction through ripping and revegetation would ameliorate these problems. Any additional access construction in these sensitive areas should employ special techniques limiting the amount of soil disturbance and use of low ground pressure equipment, and timely hydro-seeding of exposed areas.

The coarser-textured morainal deposits exhibiting moderate topography present low potential impacts but are more limited in extent than the silty deposits. In the vicinity of node C, where slopes are greater and silty materials also occur, erosion on access road cutbanks may occur and adequate mitigation measures such as re-sloping and revegetating cutbanks would be required to avoid high potential impacts.

The Fraser Canyon forms the boundary between the Marble and Camelsfoot ranges. To the west, the Camelsfoot Range consists of a variety of sedimentary and conglomerate formations and the river flows in a major fault zone between the two ranges. The east wall of the Fraser Canyon has extremely steep slopes consisting of loose, gullied, moderately-fine to coarse-textured morainal, glaciofluvial, glaciolacustrine and colluvial deposits, and exposed bedrock. The surficial materials are dominantly silty on the east side and existing gullying and surface erosion is severe in the vicinity of node C.

On the west side of the Fraser section CEF crosses a gullied, coarse-textured glaciofluvial terrace at an elevation of approximately 275 m, and then ascends the east side of the Camelsfoot Range to cross a high plateau at an elevation of approximately 1065 m, which lies between the Fraser and Bridge river valleys. Disturbance of the sensitive, steeply sloping terrain units adjacent to the Fraser could be avoided by using existing access roads servicing 5L42 and by designing a longer span at the crossing so that tower location and additional access roads for tower construction are well back of the high potential impact areas.

On the west side ascent of the valley wall, seasonal streams have cut deeply into the sedimentary rock creating a series of steep, wide gullies, and leaving ridges blanketed with rubbly colluvium and coarse-textured morainal deposits. Debris and rock slides are a common feature of this area, and further disturbance from construction activities could result in high impacts.

TERRAIN

The Bridge River forms the boundary between the Camelsfoot and Chilcotin ranges. The Chilcotin Range consists of a variety of non-granitic formations that rise progressively towards the granite ranges to the west. It is characterized by a combination of high serrate peaks rising above lower, rounded summits, and gently sloping areas of undissected uplands.

The highest impact potential occurs mainly between node C on the Fraser River and node F on the Bridge River. Impacts associated with additional access road construction and vegetation clearing would be greatest on the steep valley sides of the Fraser and Bridge rivers and the very steep creek valley slopes draining into those rivers. Any additional access road construction and vegetation clearing would aggravate the existing slide and erosion hazards. Avoidance of impacts could be achieved by spanning sensitive areas along the west side of the Fraser and not constructing access roads along sensitive slopes below the spans. The existing 5L42 access roads should be stabilized where severe erosion is evident. Clearing of vegetation under the high spans of the creek gullies and former drainages should be minimized where line clearance does not present a problem.

Over the remainder of this route moderate impacts could be expected where any additional disturbance of the surficial deposits could result in minor slides and erosion. Impact potential would be low if existing access were to be used.

The overall terrain impact potential of segment BCEF is judged to be low-moderate provided that existing access roads are used where possible, and particular attention is given to reducing cutbank slopes and reseeding in sensitive soil areas.

FRASER SUBOPTION (CDE) - 5.8 KM

On the east side of the Fraser, between the highway and the river, the Fraser (CDE) suboption transects a deep, silty morainal deposit that is deeply incised by post-glacial, inactive drainage gullies and a silty, glaciolacustrine terrace that overlies gravelly, coarse-textured glaciofluvial terrace deposits that are over-steepened and exposed along the deep river banks. The impact potential on the east side is moderate-high due to greater risk of erosion and slope failure associated with access road construction. Mitigation and avoidance measures would be similar to those described for section CE but as more additional access would likely be required for suboption CDE, impacts would be higher. The west side of the Fraser has low impact potential if the escarpment along the river bank is avoided, as the towers would be located on a level, stable terrace comprised of silty, glaciofluvial deposits which overlie coarse textured outwash material.

The overall impact potential for suboption CDE is moderate-high, and would depend on the extent of new access construction that is required and the degree of regrading and seeding of cutbanks.

ANTOINE (BG) - 44.3 KM

The Antoine (BG) segment diverts west at node B, crossing the northwest end of the high plateau of the Marble Range to a precipitous crossing of Kelly Creek. Near level-moderately sloping, deep, sandy morainal deposits occur at and immediately west of node B. The terrain impact potential on the undulating plateau deposits west of node B would be low.

The route crosses Kelly Creek canyon and descends through Cavanagh Creek valley to the Fraser. The sidewalls of Kelly Creek canyon and upper Cavanagh Creek consist of exposed bedrock complexed with gullied, rubbly colluvium, slide debris, and talus. On the east side of the Fraser the route descends 1220 m to where the surficial materials of lower Cavanagh Creek, near the confluence with the Fraser, comprise deeply incised, silty glaciofluvial deposits showing a considerable amount of slope instability. The unstable terrain along both these canyons presents a high potential hazard to the line, and severe terrain impacts could result from access road construction. The west wall of the Fraser Canyon, immediately above the river, consists of deeply incised silty and sandy, glaciofluvial and glaciolacustrine deposits. Above the lower terraces the upper canyon sidewalls consist of a stony colluvial veneer overlying a steep bedrock escarpment. At the base of the escarpment the colluvium has formed an apron of coalescing fans at slopes ranging from 15-30%. This apron has a veneer of highly erodible aeolian loam overlying the colluvium and is characterized by numerous erosion gullies.

Immediately above the canyon the route crosses a wide, near level plateau consisting of a stony, medium-textured till overlying a basalt flow which is exfoliating along the eastern escarpment edge and debris slides extend down the sides of the Fraser Canyon. Both sides of the Fraser Canyon pose a high terrain hazard due to the loose, unstable nature of the colluvial, glaciofluvial, and glaciolacustrine deposits. Slides and other erosional features are numerous on both sides of the canyon and any construction activity which results in vegetation removal and soil disturbance would greatly increase the chance of further slope failures and surface erosion. On the west side of the Fraser along the upper plateau,low impacts would be expected over most of the route due to the moderate slopes and stable surficial deposits.

Much of the remainder of segment BG through to Mission Ridge, consists of a series of ridges dissected by deep creek channels. The ridges are composed of stony, medium-textured till overlying bedrock which is exposed or close to the surface along the ridge crests. The sides of the creek channels consist of stony colluvium and morainal deposits overlying bedrock which may be exposed on extremely steep slopes.

Immediately northwest of Slok Hill the route descends the east sidewall of a deeply incised valley of a tributary of Antoine Creek; the sidewall has many deep gullies cut into rubbly colluvium, and exposed bedrock. Numerous debris slides indicate areas of high potential terrain hazard.

Between Slok Hill and the Bridge River, the route runs along the west sidewall of Antoine Creek valley which is dissected by several tributaries. The extremely steep slopes of the sidewall consist of exposed bedrock and extensive, gullied, rubbly colluvium. The many rock falls and debris slides indicate a high existing terrain hazard, and that potentially very high terrain impacts could result from road construction and tower erection in this area. The Antoine Creek valley is the main area of high impact potential, especially where the exposed bedrock of a major fault zone appears to be eroding rapidly in the upper valley. Both the upper and lower reaches of the valley have numerous colluvial and talus deposits and some evidence of debris slides. Construction of roads and tower foundations in this valley, where no access exists along the route, may trigger further slides and erosion.

At the Bridge River crossing, the north side of the canyon is formed by near vertical scarp faces of glaciofluvial terraces which are largely devoid of vegetation and show signs of active erosion in the form of slides and gullies on the steepest faces. This terrace scarp presents a high potential hazard as the river is continuously undercutting the scarp, causing slope failures. The south bank of the Bridge River at the crossing is less steeply sloping and forested, presenting lower potential impacts overall. If the high hazard scarp faces are avoided at the crossing by a wide span, and if access roads are not constructed on the steeper portions of the terraces, terrain related impacts would be low.

South of the Bridge River crossing, the route traverses a wide area of deep, kettled, hummocky, coarse-textured moraine rising gradually towards Mission Ridge. The morainal deposits become shallower and bedrock is exposed, or is close to the surface as the route approaches node G, where the route turns to run adjacent to 5L42. The slope over most of this section ranges between 35-45%. Exposed bedrock, talus deposits, shallower morainal deposits and extremely steep slopes occur on the numerous ridge crests and escarpments over which the line would pass between Bridge River and Mission Ridge. From elevation 1500-1800 m, to the north of G, periglacial processes and associated geological hazards occur, including snow and debris avalanching.

Moderate-high impact potential is associated with shallow, erodible surficial deposits, mass wasting areas prevalent along ridges, and decreased stability areas associated with talus deposits.

While there are some areas of lower potential impacts over the long segment BG route, the overall terrain impact potential is judged to be high, particularly at the Fraser and Bridge river crossings and in the Antoine Valley.

MISSION (FG) - 15.0 KM

The northeast side of Mission Ridge consists of a series of steeply sloping ridges and valleys with a deep blanket of stony, coarse-textured moraine that becomes shallower towards the ridge crest.

From node F at the Bridge River to near Moon Creek, about half way along the Mission (FG) segment, the morainal deposits blanket the under-lying bedrock to greater depths than between the Bridge and Fraser rivers. Slopes tend to be more moderate at lower altitudes but valleys become steeper and the surficial deposits shallower near Moon Creek. Although debris slides are fairly common in the surrounding terrain units, low potential impacts would be associated with line construction and maintenance over most of this section, except for a major escarpment near the head of Moon Creek where the route makes a distinct "V" shaped jog. The terrain unit consists of rubbly colluvium and weak, fractured bedrock with many rockfalls and debris slides. It may be possible to avoid hazardous areas by careful tower location but high impacts could result from access road construction through this unit.

Mission Ridge is a series of serrate peaks of exposed rock sculpted by cirque glaciers. The terrain materials in this section consist of extremely stony, coarse-textured moraine and colluvial deposits of varying depths. On either side of the ridge, extremely steep slopes associated with cirques or incised streams consist primarily of exposed bedrock complexed with rubbly colluvium and talus. These slopes are avalanched, gullied, and subject to debris slides. Construction of 5L42 resulted in considerable terrain impact in this area because of the methods used and minimum reclamation. High cutbanks and long, parallel tracks beneath the line have resulted in permanent disturbance to the surficial deposits. Although these disturbed soils do not appear to have appreciably eroded, the extreme climate severely retards natural revegetation and the soil is continuously weathering by periglacial processes associated with freezing and thawing. The steep slopes at the descent to Mission Pass consist of medium and coarse-textured moraine with minor rock outcrops.

High potential impacts and existing hazards occur at the highest elevations of Mission Ridge in the immediate vicinity of node G. Vertical rock faces, talus deposits and very steep slopes to the west and south of node G would be subject to increased slide and colluvial action if disturbed. The location of the route to the north of this area as indicated by the location of node G, avoids the high impact terrain units to the extent possible. If the existing access roads are used, high hazard areas would be avoided through careful alignment, and existing erosion could be halted through a revegetation and stabilization program; additional impacts in this area should not be excessive.

The overall terrain impact potential of segment FG is judged to be low-moderate, provided that existing access is used where possible, areas of severe soil erosion associated with existing transmission line construction are rehabilitated, and that new access is not constructed in high impact potential areas, particularly in the alpine environment.

DUFFEY (FJ) - 89.0 KM

On the west side of the Fraser north of Lillooet, the elevated, glaciofluvial terraces differ from those previously described in that the deep creek channels dissecting the terraces on the east side are generally absent. The narrow, intermittent, glaciofluvial terraces are eroded on their faces by numerous small gullies and some exhibit knob and kettle topography. At some points only small remnants of former terraces remain, with the steep mountain slopes continuing to the river. The valley sides above the terraces on the west side are extremely steep, bedrock controlled formations with surficial deposits of stony, coarse-textured colluvium of till and bedrock origin. Deep creek gullies show evidence of minor slope failures and slides. Scree and talus slopes are common on the mid-slopes and along the upper margins of the terraces.

To the southwest of Lillooet, at the base of the steeply sloping valley sides, colluvial and alluvial apron deposits of angular stones and gravels occur. Most of the Duffey (FJ) segment in this section runs through landforms susceptible to low-moderate impacts, if the steep, unstable mountain slopes are avoided by an alignment at the break in the slope, between the glaciofluvial terraces associated with the Fraser and the colluvial-alluvial apron deposits which occur above them. Access road construction that disrupts drainages and vegetative cover could result in erosion problems. Avoidance of highly erodible landforms by careful route selection and expeditious revegetation would lessen impacts considerably. The loose nature of these deposits may also result in slope failures in road cutbanks, and reduction in slope and reseeding should be undertaken as a counter measure.

The high impact potential landforms are the steep upper slopes of the mountain sidewall and the over-steepened glaciofluvial terrace scarps and creek channels. Any disturbance of the scarp faces could lead to increased erosion. The bedrock controlled valley sides exhibit unstable surficial deposits, and rock falls, loose talus, and rock slides are common occurrences. The steepness of the topography and rapid down-slope drainage would greatly increase the occurrence of slides and other erosion if the surface is disrupted by road construction, or if the vegetation were to be removed, without careful design and special construction and reclamation techniques.

Between the east end of Seton Lake and Duffey Lake the route is mainly within the Pacific Ranges of the Coast Mountains, as described by Holland (1976). The area was heavily glaciated, particularly in the upper Cayoosh Creek, Duffey Lake, and Joffre Creek areas. Bedrock consists of foliated and faulted volcanic and sedimentary rocks in the east, and fractured and jointed igneous, intrusive rocks and some foliated metamorphic rocks to the west. From the east end of Seton Lake to Duffey Lake, the Cayoosh Valley floor is very narrow and the valley sides extremely steep. To the vicinity of Mt. Rohr, on the north side of the Cayoosh Creek valley west of Duffey Lake, the dominant terrain type consists of shallow, stony morainal deposits over bedrock which is often exposed. Avalanche tracks, talus slopes, landslides and rockfalls are common features of the upper slopes of the valley sides and often extend to the valley floor. Intermittent pockets of deep, stony, coarse-textured glaciofluvial deposits and stony, moderately coarse-textured morainal deposits occur throughout this section and are most extensive where the valley bottom widens, particularly south of Gott Creek and in the vicinity of Duffey Lake. Gully erosion and some debris torrents also occur but many gullies are incised in bedrock and are associated with snow avalanches, particularly between Duffey Lake and Cayoosh Pass.

At the southwest end of Duffey Lake the valley bottom is wide and deep. Stratified, glaciofluvial deposits are mixed with stony, coarse-textured moraine. A fairly extensive wetland or fen with deep, organic soils occurs approximately 8 km west of the lake.

The avalanche tracks are generally associated with narrow drainage channels arising in the exposed bedrock of the mountain peaks. These channels are often separated by bedrock ridges and as they descend to the valley floor the channels widen and the alluvial fans formed at their base generally coalesce to form a deep, excessively bouldery apron bordering the valley floor; this is a very common terrain feature along most of the Cayoosh Creek Valley, including the shores of Duffey Lake. The area of worst snow avalanche terrain on the north side of Duffey Lake has been avoided by the route location to the south of the lake.

The Joffre Creek section of segment FJ has steeply sloping valley sides, mantled by deep, excessively bouldery and coarse-textured morainal deposits with intermittent bedrock outcrops which become more common ascending the valley walls. At the lower end of Joffre Creek the route turns sharply west and descends an extremely steep, unstable mountain face which has been deeply eroded by slides and rock falls. From near the mouth of Joffre Creek the route crosses coarse-textured colluvial materials exhibiting variable mass wasting processes associated with existing access road construction. For approximately the last 7 km to node J, the route crosses deep, coarse-textured colluvial and morainal materials where impact potential is low.

Much of segment FJ involves high terrain hazards associated with rockfalls and debris avalanches on the oversteepened, glaciated slopes. In general, the terrain hazards could be avoided by careful route alignment and the application of special construction and reclamation techniques. Snow avalanches and mass wasting (rockfall, debris avalanches, etc.) may pose construction and maintenance problems in some areas but in general most problems could be avoided by locating low on the slopes.

Transmission line construction and maintenance activities could initiate or accelerate mass wasting and gully formation in some areas such as the Gott Creek crossing and in places along the south side of Duffey Lake to Casper Creek. In these high potential hazard and erosion areas, which extend intermittently between Gott and Joffre creeks, access roads should not be constructed to tower sites. A detailed terrain study would be required to adequately determine access road layout and design in this section.

Overall terrain impact potential is assessed as high in segment FJ because vegetation removal and access road construction could result in increased erosion and slide activity.

ANDERSON (GH) - 39.5 KM

Mission Pass, 6.5 km west of node G, marks the transition between the Chilcotin Range and the granitic formations of the Coast Mountains. In the vicinity of the pass, surficial deposits are predominantly stony, sandy moraine over bedrock. The topography is less steep and the surficial deposits appear to be stable. South of the pass the Anderson (GH) segment follows deep valleys cut into the Coast Mountains by tributaries of the main river systems.

Between Mission Pass and Whitecap Creek the route crosses a gravelly, sandy glaciofluvial terrace; this deposit is generally very deep, however, intermittent bedrock ridges are located between drainage gullies and most of the terrace is deeply eroded towards Seton Lake. The terrain has moderate impact potential in this area due to steep slopes and shallow, loose surficial deposits which are susceptible to erosion if disturbed.

The Village of Seton Portage is located on a narrow floodplain deposit much of which has been encroached upon by coalescing alluvial fans on both sides. The highly eroded glaciofluvial terrace unit between the Village and the existing lines has high impact potential associated with existing gullying and surface erosion of the steep slopes, and any future construction activity such as removal of 2L1, should avoid further disturbance of this unit.

From Seton Portage to D'Arcy the route follows the west side of Anderson Lake which has two dominant terrain features: the bedrock dominated upper slopes which are overlain by a thin veneer of colluvium over much of the surface area with slopes usually exceeding 55% with avalanche tracks, talus slopes, rock falls, and rock slides as common features; and a deep alluvial-colluvial apron deposited on the lower slopes and extending to the lake. These deposits are well-drained, stony, gravelly, and coarse-textured on slopes averaging between 30-40%; they are deeply dissected by creek gullies extending into Anderson Lake and are slightly terraced with a steep scarp at the lake shore.

The most notable of these gullies is that of Whitecap Creek at Seton Portage. Avalanche areas exist on the upper slopes, some extending down to 5L42 which was damaged by an avalanche near Seton Portage. The relatively recent avalanching is in part related to the loss of stabilizing vegetation in the area of a large burn that is now regenerating back to forest cover and which should substantially reduce further erosional activity if left undisturbed. McGillivray and Connel creeks represent a high risk to any development at lake level due to flash floods and debris flows which are funnelled by the steep sides of the creek channels. Similar conditions to these exist on the north side of Gates Lake.

The entire east side of Anderson Lake from Lost Valley Creek to Wade Creek is very unstable and a massive rock slide into Anderson Lake could occur. For this reason any development on the west side should be kept a reasonable height above the lake level to avoid possible damage from wave run-up.

With the removal of 2L1, which was built from the railway and does not have associated access roads, 5L46 would be constructed by extending access roads downslope from the Highline Road to tower sites. No information on the location of the tower sites or access roads was available for this study, but detailed terrain assessment, careful design, and slope stabilization planning would be required to ensure that high terrain impacts do not occur.

Moderate impact potential is associated with the colluvial-alluvial aprons and fans occurring on the lower valley sides. When disturbed, these loose, coarse-textured deposits are subject to erosion and minor slides on steeper sites. Vegetation removal and additional access road construction over the moderate-high impact potential areas could result in substantial surface erosion, and careful alignment to avoid sensitive areas and expeditious reclamation would be required if additional access is required within sensitive sites.

Overall terrain impact potential in segment GH is low-moderate provided that new access can be limited in extent; some erosion and failure areas should be rehabilitated along the existing access roads.

BIRKENHEAD (HI) - 20.0 KM

On lower slopes and the valley bottom along Blackwater Creek, surficial materials consist of deep, coarse-textured, fluvial, morainal, and colluvial deposits in the form of fan, aprons, terraces, floodplains and blankets. A small area of shallow organic soils occurs in the wetland at the east end of Blackwater Lake which lies at the head of the creek at approximately elevation 700 m. Mid-upper slopes are mainly gravelly and rubbly colluvium of variable depth, some of which are gullied and affected by snow avalanches. Gullies appear to be confined to bedrock channels and are largely inactive in terms of continuing erosion. The dominant bedrock is composed of volcanic and sedimentary rocks of the Hurley Formation and Cadwallader Group, including argillite, phyllite, limestone, conglomerate, tuff and andesite; along the northern half of Birkenhead Lake, quartz diorite is the dominant bedrock.

West of Blackwater Lake, surface water flow is to the west into the Birkenhead drainage. Birkenhead Lake lies at an elevation of approximately 625 m, with the route approximately 150 m above the east shore.

Hazards associated with the upper to mid-valley slopes in segment HI are severe and include snow avalanches, rockfall, slumps and slides and, in a few areas, gullying. Depositional hazards exist on some lower slopes and the narrow floodplain has isolated pockets of poorly drained, fine-texture fluvial deposits and organic soils. The route should avoid the floodplain and the upper valley slopes, staying close to the toe slopes, particularly along the east side of Birkenhead Lake where avalanches and deeply incised gullies occur all along the terrain unit of the mid and upper slopes lying above the route.

Overall terrain impact potential is considered to be low-moderate along segment HI if careful alignment avoids geological hazards with respect to tower and access road location, and appropriate reclamation measures are implemented.

GATES (HJ) - 27.5 KM

Along the Gates (HJ) segment between D'Arcy and Creekside, the Gates and Birkenhead river valleys lie at less than 420 m elevation and have the characteristic "U" shape of glaciated valleys. The extremely steep, bedrock dominated valley sides are intermittently overlain by shallow colluvial deposits. These steep valley walls are broken by major tributary valleys which are steep-sided but have deeper surface deposits of moraine on the lower slopes and valley floor.

The second feature of segment HJ is the deep colluvial-alluvial aprons which occur along much of the lower slopes of the valley on both sides and in places extend completely across the valley as at the east end of Gates Lake. Coalescing alluvial fans associated with major creeks are included in these aprons which consist of deep, well-drained, loose, bouldery, gravelly sandy deposits with slopes ranging from 20-35% or more.

The third feature of segment HJ is the valley floor which is composed of terrace and floodplain deposits of the Birkenhead and Gates rivers. Nowhere are the deposits very wide or deep and they consist of pervious, stony, gravelly sand with slopes usually less than 10%. In places the watertable is perched close to the surface by underlying bedrock and drainage is impeded, which has resulted in the formation of some wetlands and organic soils. The most significant area of poor drainage and organic soils occurs between Gates Lake and Devine.

Along the entire length of segment HJ most of the upper sides of the valley are classed as high hazard and high impact potential areas. Characteristic of these valley sides is a continuous series of avalanche tracks, rock slides, talus slopes and narrow creek gullies subject to flash floods and debris flows. The highly visible slides and talus slopes surrounding the Birkenhead River valley between Spetch and Creekside are illustrative of such terrain.

The organic soils associated with the floodplain deposits of Birkenhead and Gates rivers are subject to high potential impacts if disturbed due to the compactability of the organic deposits and disruption of the existing drainage regime. Most of these deposits would be avoided in segment HJ by the new alignment off the floodplain, and removal of 2L1 within the floodplain would require care not to further disrupt these deposits.

The overall terrain impact potential associated with segment HJ is low, provided that the high hazard areas associated with the upper slopes and the organic soils of the valley floor are avoided.

OWL (IK) - 25.0 KM

South of Node I, the Owl (IK) segment crosses the upper reaches of the Birkenhead River valley at an elevation of approximately 600 m. Surficial materials on lower slopes are deep, gravelly and sandy colluvium and glaciofluvial materials. Some steep areas of shallow colluvium, talus and bedrock are also crossed. The underlying bedrock is composed of volcanic and sedimentary rocks of the Cadwallader Group (predominantly andesitic and rhyolitic breccia and flows) that outcrop on exposed ridges along the route.

The route ascends to over 1500 m near the head of Fowl Creek where bedrock changes to granodiorite extending southwest to the edge of the upper Owl Creek drainage at an elevation of approximately 1150 m. In the Fowl Creek area the rolling terrain is dominated by gravelly, morainal materials of variable depth. Hummocky, and occasionally steep, bedrock outcrops and minor areas of organic and sandy, fluvial materials also occur.

In the upper reaches of Owl Creek, terrain is once again controlled by volcanic and sedimentary rocks of the Cadwallader Group. Slopes are continuous and steeper with common surficial materials being gravelly colluvium of variable depth, talus and exposed bedrock. As in the Fowl Creek drainage, local fluvial deposits and organic soils occur, particularly in the upper basin where several small lakes and wetlands have developed in depressions.

Immediately north of the Lillooet River valley, gravelly, and sometimes gullied, colluvium, probably derived from ice contact deposits, blankets igneous intrusive bedrock, dominated by quartz diorite; the bedrock is exposed in some upper slope areas.

North of node K the route crosses deep, silty-sandy fluvial materials of the Lillooet floodplain lying at an elevation of approximately 200 m, and then to the west of Pemberton it rises steeply onto lower mountain slopes composed mainly of rubbly and blocky, shallow colluvium and bedrock to an elevation of about 650 m, terminating in the vicinity of Nairn Falls along the Green River.

No extensive areas of high terrain hazards were noted from the aerial photo interpretation and field reconnaissance of the route, with the exception of high potential impacts associated with the flooding hazard on the Lillooet River near Pemberton. This floodplain has been subject to periodic inundation since agricultural settlement, even though it is now dyked. The last major flood was in the mid-1980's. Some areas of silty soils with high erosion potential occur along the Lillooet floodplain and on some steep slopes north of the confluence of Fowl Creek and the Birkenhead River, but careful planning and alignment could avoid these sensitive sites.

Most of the high elevation alpine and sub-alpine environment in the area between Fowl and Owl creeks has no existing access which would necessitate either helicopter construction techniques or considerable construction of new access roads into the area, with high consequent risk of erosion. Terrain impacts would therefore be greater for segment IK than for segments where extensive existing access could be utilized,

The overall terrain impact potential is judged to be high for segment IK.

RYAN (IM) - 57.0 KM

The Ryan (IM) segment ascends the Tenas Creek valley from the south end of Birkenhead Lake, to the divide above the Lillooet Valley in the vicinity of Ogre Lake, reaching an elevation of almost 2000 m before falling precipitously into the valley. From the west side of the Lillooet Valley the route rises steeply again in a westerly direction through the Ryan River drainage basin, turning south to cross a high mountain ridge at an elevation of approximately 1700 m, before following downstream, and then crossing, the upper valley of Rutherford Creek at an elevation of approximately 800 m. The route then crosses the high mountain ridge between Rutherford Creek and the Soo River, reaching an elevation of approximately 1600 m before descending into and crossing the Soo Valley, immediately north of node M.

Throughout the lengthy, circuitous segment IM, most of the mountainous terrain is steep with rocky surficial deposits or exposed bedrock, broken by intermittent, deep creeks and rivers characterized by floodplains of varying widths and geomorphology. Surficial materials are shallow on upper slopes but deep fluvial and colluvial materials occur along larger tributary and river valleys including the Birkenhead, Ryan, Lillooet, Rutherford, and the Soo. With the exception of the Lillooet floodplain and a few, small wetlands, surficial materials are generally coarse-textured: rubbly colluvium, sandy and gravelly fluvial deposits along the drainages, and predominantly coarse-textured moraines and colluvium on the mountain slopes. Ridgetops, peaks and many upper slopes are dominated by exposed bedrock. Bedrock along the route consists of igneous, intrusive rocks, mainly granodiorite and quartz diorite of unknown age, and of volcanic and sedimentary rocks of the Gambier (to Upper Cretaceous age) and Cadwallader (Upper Triassic age) Groups. Rocks include tuff, breccia, basalt flows, conglomerate, limestone and argillite, as well as some metamorphic rocks such as greenstone and phyllite.

Terrain impact potential is generally low-moderate along much of the route but intermittent units have high potential due to the occurrence of existing hazards, particularly along the steepest drainages. Rockfall is the most widespread hazard occurring on many of the steepest slopes. Erosion and depositional hazards also exists along some lower slopes. Landslides and slumping are also potential hazards on steep colluvial veneers, as is evidenced by existing scars. Two extensive areas pose a high hazard due to snow avalanching, slides and rockfalls: one running along the north side of the upper half of Tenas Creek, and the other lying along both sides of the Ryan River from approximately the middle reaches up to the upper portion of the tributary that the route follows south to the ridge between the Ryan River and Rutherford Creek. Potential impacts associated with tower and access road construction in these areas are high both in terms of line security and increased erosion, including slope failure and debris flows and slides.

Over most of segment IM, where logging access roads exist in the major valleys and could be used for transmission line construction and maintenance, (i.e. most of Rutherford Creek and the lower half of the Soo River), additional impacts to those that have already occurred could be kept to a low level by restricting further road construction. In areas where no access currently exists, which includes most of the upper watersheds and almost all of the major mountain ridges, impacts would be high.

The overall terrain impact potential of segment IM is rated moderate-high.

PEMBERTON (JK) - 10.0 KM

Between Creekside and the Lillooet River the route passes over deep, sandy morainal deposits overlying bedrock ridges. Within the Lillooet Valley immediately northwest of the route, the Village of Pemberton is located on a gently sloping, gravelly alluvial fan that extends onto the floodplain. Along the north wall of the Pemberton Valley the bedrock slopes steeply to the valley floor and there is a considerable amount of rock fall and talus along the base of these slopes and at the base of intermittent ledges rising up the slope.

The Lillooet River floodplain is level to slightly depressional and consists of poorly drained silts and sandy fluvial deposits with organic soils in depressional areas; it generally exhibits moderate to high impact potential due to flooding and erosion hazards, with the greatest hazards associated with actively eroding sections of the river channel. Intermittent organic deposits in depressions throughout the floodplain also have high impact potential due to their poor bearing strength and susceptibility to erosion if drainage is disrupted. The high flooding hazard areas along the current channels of the floodplain can readily be avoided through careful planning and minor route adjustments. However, even with the level of dyking that currently exists along the river, risks cannot be entirely avoided, as is evident from the mid-1980's flooding.

South of Pemberton the route rises steeply up the prominent, exposed bedrock ridge of Signal Hill between Green River and the highway. The bedrock ridge has intermittent, shallow, stony colluvial and scree deposits at the base of steep slopes and along narrow ridges which would present high hazards due to potential rockfall if the talus deposits were disturbed by access road construction. If these materials are avoided by careful access road and tower location, potential terrain impact would be low. Near node K the Green River is confined to a very narrow gorge in which Nairn Falls occurs.

Overall terrain impact potential for segment JK is low provided that high hazard areas are avoided through careful routing and tower placement.

GREEN (KL) - 2.0 KM

South of node K the Green River valley bottom widens and glaciofluvial and fluvial deposits occur as terraces and fans, primarily on the west side, with the east side formed by the steep, shallow colluvial and bedrock slopes of Mount Currie. Numerous gravel pits have been developed along the river terraces. After crossing the Green River northeast of Nairn Falls, the Green (KL) segment follows the lower slopes of Mount Currie. Bedrock outcroppings are dominant with colluvial apron and talus materials occurring at the base of steep slopes and on narrow ledges. The mid-upper western slopes constitute a high hazard area and numerous avalanches and rock slides occur along the mountain side.

Segment KL along the lower slopes avoids the high hazard areas and impact potential is low provided that towers and access roads are carefully located to avoid disturbance of talus depositions and active drainage gullies.

SOO (LM) - 18.0 KM

The entrance to the Soo Valley near the Green River confluence is a restricted passage between high bedrock ridges. At the valley entrance and for a few kilometres to the west, the valley slopes are extremely steep and are dominantly exposed bedrock with extensive talus slopes composed of extremely large boulders. South of node L, the Soo (LM) segment crosses the Green River valley on an angle and runs across a mountain ridge lying between Rutherford Creek and the Soo, approximately 900 m in elevation, covered with shallow to deep, stony, coarse-textured morainal deposits. The bedrock includes outcroppings of weak, erodible chlorotic and serpentine type rocks that are subject to decomposition and erosion, including mass wasting, on disturbance of steep slopes. Within segment LM, the area of most concern is the steeply sloping sidehill along the west side of Highway 99. After crossing the ridge, the route then descends to cross the Soo valley approximately 5 km west of the Green River confluence, where the valley shows the typical U-shape of deep glaciated valleys, but with a fairly broad floodplain.

In the Soo Valley, the toe slopes are composed of deep bouldery and stony, coarse textured, compacted glacial till overlain by a veneer of loose, bouldery and stony till. The toe slopes are generally less than 30% increasing to between 40-60% up-slope. The deep blankets of glacial till progressively thin out up-slope and the surficial materials appear to be more colluvial in nature with a higher component of coarse, angular bedrock fragments. Intermittent bedrock ridges extend into the valley bottoms and talus slopes are common along both valley sides. In the middle reaches of the Soo, north of the westerly half of segment LM, the meandering stream cuts through wetlands with extensive organic deposits which are interspersed with fluvial deposits laid down by the meandering streams. In places the talus material and rockfall debris extend onto the perimeter of the wetlands.

High terrain impact potential is associated with the extensive talus deposits and rock slides which are common among the pervasive bedrock outcrops of the valley sides. Similarly, the wetland units would be subject to high impacts if disturbed by construction activity.

The route has been aligned to avoid the wetland areas as well as deposits of unstable fluvial and talus material by travelling on the lower slopes of the south side, utilizing where possible the bedrock outcroppings and ridges which extend into the valley floor. Over the toeslopes, potential terrain impacts are low, even where the present logging road would have to be extended.

The overall terrain impact potential in segment LM is assessed as moderate-high.

WHISTLER (LN) - 37.0 KM

To the south of node L, the Green River valley floor is narrow and characterized by deep, stony fluvial deposits associated with the Green and Soo rivers and Rutherford Creek. Smaller alluvial fan deposits are associated with the various other creeks draining the valley walls. The fluvial deposits are rapidly drained but infiltration may be restricted due to the proximity of the bedrock to the surface. They are also subject to extensive erosion when the creeks and rivers are in full flood.

Particularly hazardous is the Green River slide area in which overlapping rock slides occur opposite the Soo confluence showing evidence of continuous downward movement. There is also potential for further massive slope failures which would result in debris sweeping across the valley. This terrain poses high potential hazards to transmission line construction and maintenance, and access road construction could result in high impacts on terrain due to induced slides. The existing lines traverse the toe of the slide.

Rutherford Creek flooding in 1980 and 1990 resulted in major erosion of the fluvial deposits at the Green River confluence and damaged transmission line towers on the floodplain, indicating the high hazard associated with these types of deposits in the immediate proximity of the rivers and creeks. Although this is primarily an issue of line security and can be dealt with by setting towers back from the streams, the need to provide heavy foundations and riprap armament to the base of towers where flooding is a hazard could result in environmental impacts because of the need for in-stream work and ensuing changes to the hydrologic regime.

Throughout the Green River section, moderate impact potential is associated with alluvial fan, colluvial and slide deposits along the margins of the floodplains above the break-in-slope, where access road construction may result in slope failures and surface soil erosion. Between Green and Alpha lakes the valley walls consist largely of bedrock with a thin covering of morainal material. In the valley floor drainage is impeded by bedrock at the outlets of Alpha and Green lakes with the result that lakes and wetlands and related organic soils have been formed. The active tributaries to the valley such as Fitzsimmons, Whistler and Twenty-One Mile creeks have built up large fans which extend onto the valley floor.

The extensive wetland and organic soils between Alta and Green lakes, in which the watertable is at or near the surface, have high construction impact potential if the organic deposits are disturbed because of the ensuing disruption to the drainage regime and consequent erosion, particularly of the shallow organic soils.

Potential hazards are associated with Fitzsimmons and Twenty-one Mile creeks which both have steep and actively eroding sides which could, in the event of a large slide damming the creek, eventually result in a flash flood and debris flow of considerable force descending the creek channels. The route crosses both creeks on or near the valley floor. Wedge Creek represents a similar hazard, but the possibility of debris flows and flash floods is enhanced by possible massive icefall into Wedge Lake resulting in a wave of water surging downstream (pers. comm., N. Skermer). The valley floor margins have moderate impact potential associated with colluvial aprons and alluvial fans which would be subject to erosion and slope failure if disturbed for access road construction.

Use of the 2L1 ROW through the lakes area of Whistler would result in a low degree of additional impact if existing access roads and tower locations are used with little or no additional disturbance. However, the spans for 5L46 would be different from those of 2L1 and new tower locations and foundations would generally be necessary. The foundation loads associated with 5L46 would be greater and piled foundations are proposed in areas where soil bearing strengths are low, which would require temporary access roads for construction. To the extent that additional disturbance would be significant, high impacts could result, particularly within the wetlands and along colluvial deposits occurring at the margins of the fluvial deposits.

Where the route diverges from 2L1 on the southeast shore of Green Lake and to the ridge west of Nita Lake, impacts would be low because of stable terrain dominated by bedrock, if higher hazard areas associated with existing talus deposits and rockfall are avoided. The layout and construction of access roads within these new sections would require careful planning to ensure that these areas are avoided. Because of the intensive land use within the Whistler area, a rigorous reclamation plan should be designed both for existing and future disturbed areas associated with electrical transmission.

The route crosses the Cheakamus River at the large bend where it leaves the mountain slopes and enters the main valley, passing over a coarse-textured, glaciofluvial fan deposit before ascending the lower mountain slopes on the east side of the valley. The lower slopes are composed of shallow, stony, coarse-textured morainal deposits on hummocky bedrock knolls and steep bedrock controlled ridges extending to the northeast end of Daisy Lake. In general, low impact potential is associated with these stable materials, although rockfall may pose isolated hazards, particularly at the base of steep, localized ridges.

At the north end of Daisy Lake a continuous bouldery talus apron with slopes exceeding 50% occurs on the west shore at the base of the canyon walls and then hooks around the north end of the lake enclosing an area of well-drained floodplain and fluvial deposits associated with Brandywine Creek; 5L46 would span the hazardous areas of scree and talus materials. As no access or clearing would be required in the Daisy Lake drawdown zone and the Cheakamus floodplain, impact potential is low.

With careful alignment and adequate mitigation, overall terrain impact potential for segment LN is expected to be low.

RAINBOW (MN) - 23.0 KM

The Rainbow (MN) segment extends from above the middle reaches of the Soo River, at an elevation of about 1100 m, through Rainbow Pass on the northwest side of Rainbow Mountain, before descending gradually to the confluence of Callaghan Creek and the Cheakamus River near McGuire.

Rainbow Pass is a high elevation, deep, V-shaped valley between high mountain peaks, with extremely steep side slopes composed dominantly of exposed bedrock with extensive boulder talus and scree deposits along the lower slopes. In general, over the upper mountain slopes of the pass, surficial deposits are extremely shallow and appear to be dominantly colluvium with a high component of angular bedrock fragments. On the northeast side of Rainbow Pass active avalanche tracks extend across the route. Although the pass is narrow and hazards occur intermittently on both sides, it appears that both the active avalanche chutes and scree slopes could be avoided by careful route alignment and tower placement. Access construction in this pass could result in high impacts.

North of Alexander Falls where the steep, bedrock-dominated mountain slopes give way to more gentle valley slopes, the surficial materials are deeper, dominantly bouldery, coarse textured glacial till with intermittent bedrock ridges and outcroppings. Many steep gullies have been cut into the surficial material by small tributary streams. If these tributaries are avoided by spanning, impacts on terrain would be low in this area. South of Alexander Falls the route passes through the valley bottom of Callaghan Creek and along the lower mountain slopes to the west. The surficial deposits of the Callaghan Creek valley appear to be dominantly stony, coarse textured moraines, with lesser extents of glaciofluvial and recent fluvial material, overlying occasional bedrock outcrops. Impacts are expected to be low in this stable terrain.

At the Callaghan Creek/Cheakamus confluence there are several deposits of floodplain and alluvial fan material on both sides of the river and creek which appear to be deep, well-drained sands and gravels ranging from level to 10% in slope. Between McGuire and the north end of Daisy Lake a widening of the valley floor occurs and coincides with the basaltic lava flows associated with the Callaghan valley. The lava flow bedrock landform is particularly hummocky in this area and small lakes and organic deposits occur in most depressions. The granitic bedrock landforms are mostly bare rock with frequent talus slopes but some areas have shallow morainal and colluvial veneers.

Overall terrain impact potential in segment MN is assessed as moderate provided that access construction is avoided in the Rainbow Pass area.

UPPER CHEAKAMUS (NP) - 12.8 KM

In the Upper Cheakamus (NP) segment, on the west side of Daisy Lake, lava flows and quartz diorite bedrock with shallow veneers of colluvium are dominant. An area of slightly deeper surficial material occurs near the north end of the lake and appears to represent a depressional area in the bedrock at the edge of the lava flow where it meets the granitic rock. The unconsolidated materials are coarse-textured and pervious, however the bedrock impedes drainage and most of this area is wet and some organic deposits occur. This area of stable terrain has low impact potential if the 2L1 ROW and existing access are used and if the depressional poorly drained and ponded areas are spanned.

Between Rubble and Culliton creeks the Cheakamus floodplain deposits are narrow and almost disappear except for small, isolated pockets. The exposed bedrock extends to the creek edge and narrow aprons of talus lying parallel to the river occur frequently. At Rubble Creek on the east side there is a wide fan extending across the valley, created by massive rock and debris flows associated with a failure of the Barrier wall at the head of Rubble Creek; the slides occurred at various times, the latest being about 130 years ago. These deposits consist of poorly sorted cobbles and boulders and some areas in the centre of the slide have only a thin cobbly layer over existing morainal materials; slopes range from 5-20%. Permeability is high through the flow deposits, although underlying layers may be less pervious. The portion of the valley between the south end of Daisy Lake and the head of the canyon, which encompasses the high hazard area associated with the Barrier, has been declared a "Slide Hazard Area" where land use is restricted by Order-in-Council 1409, but transmission lines are permitted. The Rubble Creek hazard has been studied in detail by the B.C. Ministry of Highways (1978).

A terrain unit with isolated rockfall hazards is located at the south end of the Cheakamus Canyon where the route follows a ridge west of the Cheakamus River. The drainage gully on the west side is deeply eroded and exposed bedrock knolls subject to rock fall occur intermittently along the ridge to a short distance north of node P. The route through this unit would require careful tower and access road location and design to avoid the rockfall hazard areas, which could be achieved by tower placement on the knolls, and by limiting the extent of access road construction.

Terrain impact potential for segment NP is low-moderate provided that: tower sites are carefully located along the bedrock ridges and knolls; and access roads are not constructed in areas where potential rockfall presents high hazards.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

Approximately 12 km north of Cheekye in the vicinity of node Q, the valley widens abruptly to form a narrow floodplain composed of coarse-textured deposits extending to the Squamish River confluence. The Cheakamus Valley has the typical U shape of a glacially formed valley and differs from the Squamish valley in that it has a very limited floodplain. The valley walls rise abruptly on both the east and west sides.

The Cheakamus Valley floor and sides are dominated by exposed quartz diorite bedrock. Minor deposits of colluvium collect in cracks and depressions but represent a very small percentage of the landform. Thicker deposits of compact sandy moraine occur in some tributary valleys, however bedrock control remains a dominant feature. At the base of steeper slopes talus aprons occur characterised by very large boulders.

Where Culliton Creek enters the Cheakamus there is a small fan of bouldery, sandy gravelly deposits with slopes ranging from 20-30%. The valley floor between Cheekye and Culliton creeks is a narrow floodplain of very permeable sandy gravels with slopes usually less than 5%. Despite the permeability of these deposits, subsurface drainage is restricted by the high watertable which is controlled by Cheakamus River levels. Another feature of the valley floor is an almost continuous apron of colluvium which occurs at the base of the steep bedrock dominated valley sides and the floodplain. This colluvium consists of rubble and very large rocks on slopes ranging from 30-50%.

There are two areas of potentially high hazard in the Lower Cheakamus (PQRT) segment. Although no direct impacts on these areas would result from transmission line construction, the destructive potential of both areas is considerable, in terms of line security. A high potential hazard occurs at Cheekye where mud flows could originate from a large area in the upper watershed of the Cheekye River. Mud flows surging down the river bed could represent a hazard to the substation located on the Cheekye fan. The magnitude of the mud flows and possible triggering mechanisms have been studied by the MOE (Woods, 1976). Towers have been, and should be, sited on the available bedrock outcrops to ensure line security.

High potential hazards also occur at Culliton Creek where earth and rock flows could result from massive collapses of unconsolidated materials into the drainage channels. Culliton Creek has no previous history of massive earth flows, however conditions in the upper watershed of the creek are similar to those of the Barrier on Rubble Creek and represent a similar risk, particularly as a result of recent logging within the watershed and increased potential for debris build-up in the creekbed. Early in 1981 a period of high precipitation resulted in major flooding of Culliton Creek with a complete washout of the highway and a major rechanneling through much of the alluvial fan at the Cheakamus River confluence. Although there was no damage to the existing transmission lines, future flooding could threaten line security on the fan.

Moderate impact potential occurs in other areas where minor slope failures and erosion can be expected on cutbanks and road surfaces.

Overall terrain impact potential for segment PQRT is expected to be low, assuming judicious tower siting and limited access road construction, particularly along coarse colluvial deposits.

West (PR) Suboption - 10.0 km

The west (PR) suboption traverses the lower mountain slopes on the west side of the Cheakamus River where towers would be located on a series of bedrock ridges and knolls. Steep, exposed bedrock is dominant with stony, coarse-textured morainal and colluvial veneers over less steeply sloping areas. Bouldery talus and scree deposits occur at the base of steep slopes. Potential impacts vary from moderate-high as a result of potential rockfall hazards, particularly along the very steep slopes. These impacts could be avoided by careful tower location and very restricted access road construction through this suboption.

If additional access is not constructed, or is very limited in extent, overall impact potential is judged to be low in suboption PR.

East (QS) Suboption - 10.0 km

The east (QS) suboption runs along the lower slopes and rocky ledges of the east side of the Cheakamus. The terrain is very similar to that encountered on the west side and potential impacts are also similar. The magnitude of impacts could be greater on this side as the extent of rockfall deposits is greater and more tributary steams of greater size also occur (refer to description of terrain for Segment PQRT).

If careful tower location avoids hazardous areas associated with talus slopes and tributary streams, and access can be minimized, overall terrain impact potential is judged to be low.

South (RST) Suboption - 6.1 km

The south suboption (RST) transects a broad, lower mountain ridge on the east side of the Cheakamus. Exposed bedrock is dominant, with very limited extents of stony colluvial material in depressions and along isolated ledges. A continuous apron of bouldery scree deposits occurs along the break-in-slope between the ridge and the Cheakamus floodplain, but is avoided by the route alignment. Within the Cheekye fan deposit, a prominent rock outcrop appears to be a suitable site for tower location to avoid the flood and debris flow hazard.

Overall terrain impact potential is low in suboption RST, although the construction of new access could result in increased rockfall hazard at the base of isolated steep slopes.

1990 ALTERNATIVES

ORE (UV) - 38.0 KM

The Ore segment (UV) crosses extensive, steep terrain subject to surface erosion, debris flows and slides in the Ore Creek drainage and along the Yalakom River. For the first 7 km west of node U the route crosses subdued terrain dominated by deep, cobbly and sandy morainal surficial materials. Over the next 10 km from the vicinity of Mount Birch to the mouth of Ore Creek, the route crosses steep terrain dominated by bedrock and coarse-textured colluvial materials of variable depth.

Much of the terrain along segment UV has high potential for debris flows, debris slides and surface erosion. From the mouth of Ore Creek to node V, a variety of terrain types are crossed including gravelly, glaciofluvial materials and deep, gravelly, sandy, morainal materials. Potential terrain impacts in segment UV are high where steep, gullied morainal materials are crossed and on the steep slopes composed of colluvial veneer and bedrock in the vicinity of the Bridge River crossing.

The overall terrain impact potential in segment UV is judged to be high, particularly because existing access in steep terrain areas is very limited.

BRIDGE (F1X) - 19.7 KM

The Bridge (F1X) segment ascends the North Blackhill Creek drainage on the west side of the Fraser from node F1 on the 5L42 ROW, taking advantage of ridges and bedrock outcrops. It then passes along the base of steep colluvial materials and bedrock, avoiding steep, potentially unstable colluvial slopes immediately to the south. For the first 5.5 km of the route the terrain hazard and impact potential is low-moderate, after which steep, coarse-textured colluvial blankets and veneers with some gullies are crossed, exhibiting moderate-high impact potential. Other unstable areas of steep, gullied colluvium and coarse-textured glaciofluvial materials are avoided by means of a relatively low alignment on the slope across Applespring Creek.

Terrain hazards from mass wasting and surface erosion are low-moderate until approximately 3 km past Applespring Creek after which steep, gullied and failing colluvial surficial materials, with high potential impacts are again encountered on the slopes above Bridge River. Near node X, in the Antoine Creek valley, the slopes are steep and rugged with moderate-high impact potential due to rockfall, slides, and slope failure. Node X is located on a sandy, gravelly, glaciofluvial terrace. Erosion of the terrace scarp by the Bridge River poses a long term hazard, but no impacts would occur on this terrain if no new access is constructed and the scarp face is left undisturbed.

The route traverses some very sensitive terrain, particularly the steep, coarse-textured and sometimes failing colluvium between kms 5.5-8, kms 10.5-13.5, kms 15-15.5, and kms 16-16.5, all of which have high impact potential. Location, construction and maintenance of access roads would require special attention to avoid terrain impacts, such as mass wasting and surface erosion.

The rugged segment F1X is judged to have high overall terrain impact potential, unless construction of new access roads is avoided in the moderate-high potential impact terrain areas.

EAST PAVILION (WW1DE) - 11.8 KM

Between nodes D and E the East Pavilion (WW1DE) segment is the same as the DE section of the Pavilion (BCEF) segment, where terrain impact potential is rated as moderate-high on the east side of the Fraser and low on the west side. Although segment WW1DE crosses erodible surface materials on both sides of the Fraser, the potential impacts appear to be lower than for the South Pavilion (W1F1) segment described below. The section of the route between nodes W and W1 is on moderate terrain east of Pavilion with low terrain impact potential. The W1D section crosses the well known, massive flow/slide south-east of Pavilion Village. Although it would not require placement of a tower on the slide, the stability of the intact valley wall has not been assessed as part of this study.

The overall terrain impact potential of segment WW1DE is judged to be moderate, assuming the valley wall south-east of the village is stable.

SOUTH PAVILION (W1F1) - 8.5 KM

On the South Pavilion (W1F1) segment, the slopes rising along the route on both sides of the Fraser are subject to surface erosion and to debris slides, slumps and flows. Terrain impact potential is probably greater than for the W1DE section of segment WW1DE.

On the basis of this preliminary review, segment W1F1 is judged to have moderate-high terrain impact potential.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton (G1G2) suboption crosses the same general terrain types as those encountered farther downslope on the Anderson (GH) segment. However, suboption G1G2 likely would have greater terrain impact potential because of more sensitive steeper terrain, closer proximity to avalanche areas and the need to construct a new access route.

Suboption G1G2 is judged to have high terrain impact potential.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

The D'Arcy (H1H2) suboption leaves the 2L1 ROW from a point 1 km back from and well above the Anderson Lake west shoreline; the route then crosses the lake for 1.5 km in a south-easterly direction to the east shoreline. There are potential flooding and depositional hazards associated with the alluvial fans of Haylmore and John creeks south of the Anderson Lake crossing.

The overall terrain impact potential of suboption H1H2 is judged to be low-moderate because of potential impacts associated with steep slopes particularly on the south-east side.

LOKLA SUBOPTION - 1.0 KM

Potential terrain hazards on the short Lokla suboption on the valley floor are the same as on the route through Lokla IR 4 on the Gates (HJ); the terrain impact potential is judged to be low.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

The Function (Y1Y) suboption traverses the base of slopes on deep, gravelly terrain, on the 2L1 ROW then crosses the valley on gravel deposits of the Cheakamus River. An advantage would be the avoidance of placing a tower in the Miller Creek wetlands.

Overall terrain impact potential is judged to be low in suboption Y1Y.

CALLAGHAN (N1Y2) - 7 KM

The Callaghan (N1Y2) segment crosses some moderately steep morainal and colluvial surficial materials and some steep bedrock. Segment N1Y2 may have slightly higher terrain impact potential than the N1N2N section of the Rainbow (MN) segment.

Terrain impact potential from rockfall, debris slides and surface erosion is judged to be low-moderate in segment N1Y2.

HIGH CHEAKAMUS (YZT) - 36.6 KM

The High Cheakamus (YZT) segment runs south along a high ridge up to approximately 450 m above the east side of Daisy Lake. In this area the dominant surficial materials are shallow, coarse-textured colluvium on steep, hummocky terrain with many bedrock outcrops; terrain impact potential is judged to be low-moderate due to rockfall on steep slopes, if new access roads for line construction and maintenance is required.

East of Garibaldi, the route traverses the Garibaldi Hazard Area (refer to segment NP) with a high crossing of Rubble Creek. No particular terrain impacts related to the Barrier hazard are expected, if towers are not located on slide debris. South of Rubble Creek, the route transects terrain units that are dominated by very steep rock outcrops with intermittent shallow, rocky colluvial deposits that are rated as having moderate-high impact potential due to a rockfall hazard along steep slopes. From the right angle turn, north of the Cheekye River, to nodes Z and T, the route crosses alluvial fan and floodplain deposits that are complexed with marginal colluvial deposits, and intermittent bedrock outcrops.

Scattered talus slopes and gullies incised in bedrock occur intermittently along much of the route. Moderate and high terrain impact potential is associated primarily with the rockfall hazard along steep slopes. As for the Upper (NP) and Lower (PQRT) segments, the major potential impacts are associated with access road construction and maintenance. Avoidance of impacts would require judicious siting of towers, and helicopter construction techniques where a high incidence of rockfall would occur as a result of access construction. Care would also have to be taken to avoid or minimize disturbance to the slopes above Culliton Creek during construction (refer to segment PQRT). As with segment PQRT and the east (QS) suboption, segment YZT crosses the deposition area of debris flows in the Cheekye River but suitable rock outcrops exist for tower placement and the potential terrain hazard is low.

The overall terrain impact potential for segment YZT is judged to be low-moderate, assuming careful tower location and restricting new access construction in high rockfall hazard areas.

PINECREST (Y1N2P1) - 21.6 KM

From the vicinity of node Y1, to just north of Callaghan Creek, the Pinecrest (Y1N2P1) segment follows the lower slopes of the Cheakamus River valley wall transecting steep, bedrock controlled terrain dominated by shallow, gravelly morainal veneers and rubbly colluvial deposits, with intermittent bedrock outcroppings. In isolated areas, moderate potential terrain impacts are associated with steep bedrock slopes, talus deposits at the base of steep slopes, and hazards due to existing and potential rockfall. Most of these areas could be avoided through judicious location of the towers and line, if the construction of new access for construction and maintenance purposes is kept to a minimum.

Where the route crosses over the Callaghan and Brandywine valleys at their confluence with the Cheakamus Valley floor, the terrain consists of relatively level, deeper, gravelly, coarse-textured morainal and glaciofluvial deposits with no associated significant impact potential.

Just south of node N2, the route diverges from the highway and leaves the valley floor, to travel up the lower mountain slopes to the west of Daisy Lake, which dominately comprise gravelly and stony, coarse-textured morainal veneers and blankets, with bedrock outcroppings interspersed along ridges and knolls. The amount of bedrock exposure is greatest immediately west of Daisy and Pinecrest lakes. No significant terrain impacts would occur in this section of the route if new access construction could be avoided through the prominent bedrock outcrops which would require considerable blasting with consequent high rockfall hazard.

At the south end of Daisy Lake, west of the dam, the route crosses over the small reservoirs that form part of the collection system, transecting gravelly, coarse-textured, deep, morainal and glaciofluvial deposits along the Cheakamus River floor. The route crosses the narrow, active floodplain of the Cheakamus River at its confluence with Rubble Creek, and then travels south adjacent to 5L42 through the Garibaldi Hazard Area. No significant terrain impact potential occurs along the valley floor if the active channelled areas of the river are avoided by spanning. The Garibaldi Hazard Area poses potential geological hazards associated with further failure of the Barrier and consequent debris flows in Rubble Creek but this potential would not be exacerbated by line construction.

The overall terrain impact potential in segment Y1N2P1 and its east suboption is judged to be low.

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MAP SERIES I

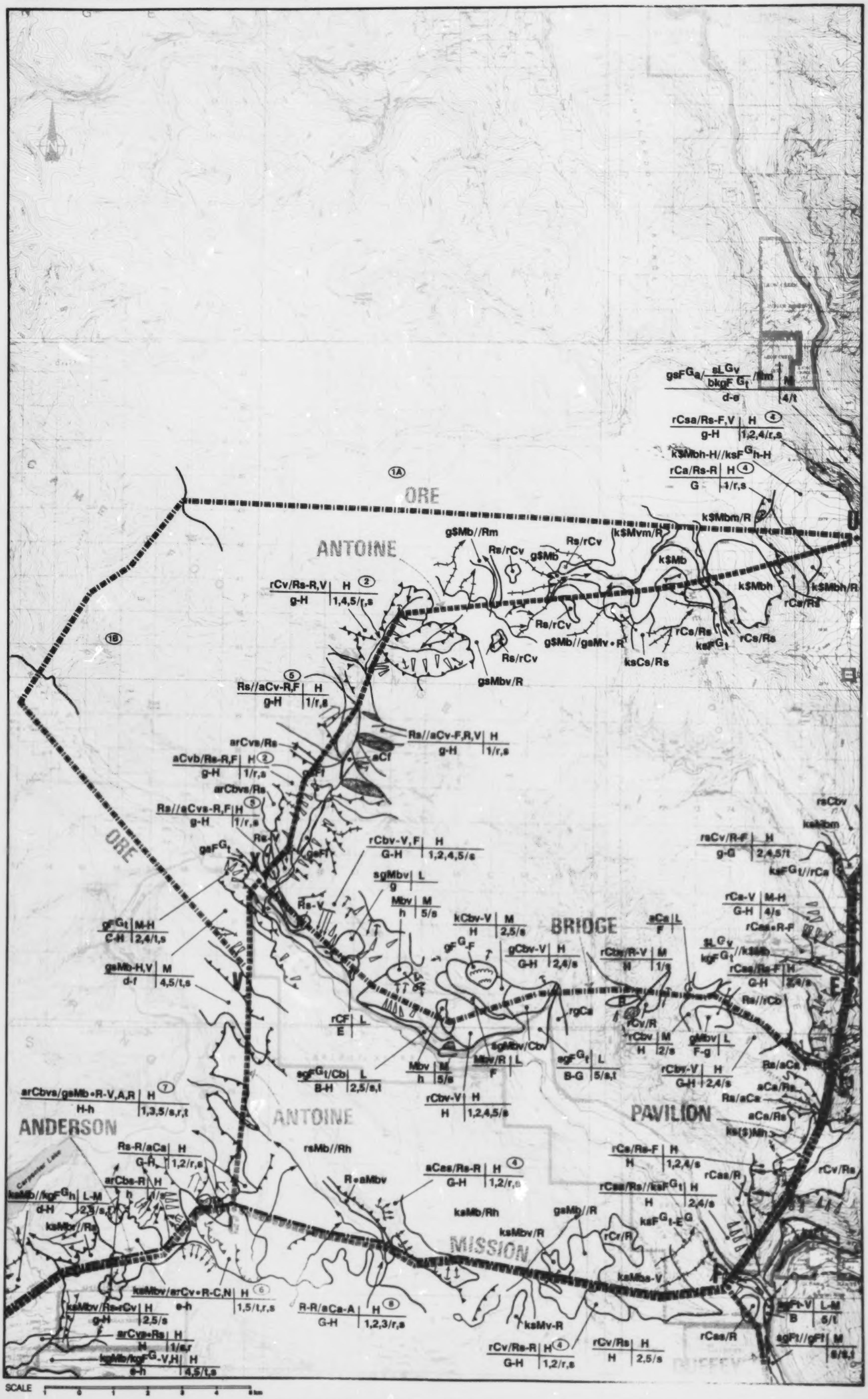
Terrain

Camelsfoot	**1 West**
Fraser River	**1 East**
Bridge River	**2**
Cayoosh	**3**
Anderson	**4 North**
Duffey	**4 South**
Gates River	**5**
Pemberton Valley	**6**
Whistler	**7**
Cheakamus	**8**

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CAMELSFOOT

TERRAIN I – 1 West



TERRAIN
Map Series I
LEGEND

TRANSMISSION SYSTEM

EXISTING

2L1 RoW - not utilized for 5L46
2L2
2L90 and 2L91
3L2
5L41
5L42

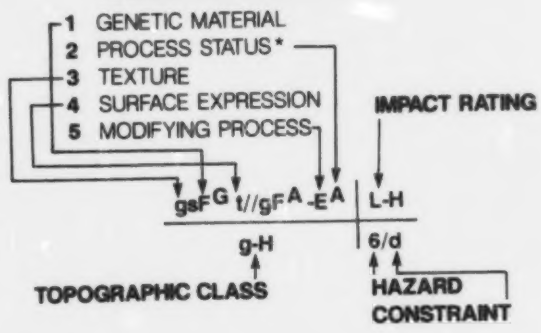
5L46 ROUTE ALTERNATIVES

1989 NETWORK - Utilizing 2L1 RoW
1989 NETWORK - Utilizing New RoW
1989 NETWORK - Utilizing Existing Unoccupied RoW
1990 ALTERNATIVES - Utilizing 2L1 RoW
1990 ALTERNATIVES - Utilizing New RoW
A• NETWORK NODE

The assessment of potential impacts on terrain of transmission line construction and maintenance is based on terrain classification, topography, existing and potential hazards and physical constraints. The terrain classification is given for each distinct land type transected by the route alternatives. Impact ratings and the associated topography, hazard(s) and constraint(s) are shown only for land types where the potential impact was assessed to be low to moderate or high.

EXPLANATION OF MAP NOTATIONS

TERRAIN CLASSIFICATION



Units consisting of two or more types of terrain are designated by two or more groups of letters separated by slashes and/or dots. These composite units are shown where two or three types of terrain are intermixed. Symbols (defined below) are used to indicate the relative amounts of each terrain type, and the components are shown in decreasing order of importance.

•	the components on either side of the symbol are approximately equal
/	the component in front of the symbol is more extensive than the one that follows
//	the component in front of the symbol is considerably more extensive than the one that follows
———	A horizontal line with a material designation below indicates a stratigraphic change

TERRAIN CLASSIFICATION

(Modified from E.L.U.C. Secretariat, Terrain Classification System, 1976, Victoria, B.C. and J.M. Ryder, Terrain Legend for the Quadra Project Area, NTS Sheet 92 G/14, 1980, Ministry of Environment, Victoria, B.C. For complete explanation of terrain classification legend refer to Terrain Classification System, ELUC Secretariat (1976).

1 GENETIC MATERIAL
(designated process status)*

A	anthropogenic (A)
C	colluvial (A)
F	fluvial (I)
F^G	fluvioglacial (I)
L^G	glaciolacustrine (I)
M	morainal (I)
O^F	organic (fen)(A)
R	bedrock (I)

2 PROCESS STATUS

A	active
I	inactive

*Process status descriptors are shown only where the current state of activity is contrary to the state designated in brackets for Genetic Material.

3 TEXTURE

b	bouldery
k	cobbly
g	gravelly
s	sandy
$	silty
c	clayey
r	rubbly
a	blocky

Where two textural terms are used together, they are written in order of increasing importance, e.g. $s is silty sand, sg is sandy gravel. Brackets indicate two distinct textures are characteristics of the same unit.

4 SURFACE EXPRESSION

a	apron
b	blanket (>1m)
f	fan
h	hummocky
l	level
m	subdued
r	ridged
s	steep
t	terraced
v	veneer

The use of two (or more) surface expression symbols together implies that there is a mixture of discrete forms, not a set of intermediate forms. Where more than one surface expression symbol is used, no significance is attached to the order in which the symbols are written.

5 MODIFYING PROCESS
(designated process status)*

-A	avalanched (A)
-C	cryoturbated (A)
-E	channelled (I)
$-E^G$	channelled by meltwater (I)
-F	failing (A)
-H	kettled (I)
-N	nivated (A)
-R	modified by rapid mass wasting (A)
-S	soliflucted (A)
-V	gullied (A)

These letter symbols are used where a relatively large portion of a terrain unit is affected by the modifying process. On-site symbols are also used to indicate modification of a part of the unit by features such as gullies or avalanches.

TOPOGRAPHIC CLASS

(Canadian Soil Survey Committee, The System of Soil Classification for Canada 1974 (revised)).

Simple Slope (REGULAR SURFACE)	SLOPE %
A depressional to level	0- 0.5
B very gently sloping	0.5- 2.0
C gently sloping	2.0- 5.0
D moderately sloping	5.0- 9.0
E strongly sloping	9.0-15.0
F steeply sloping	15.0-30.0
G very steeply sloping	30.0-60.0
H extremely sloping	>60.0

Complex Slope (IRREGULAR SURFACE)	SLOPE %
a nearly level	0- 0.5
b gently undulating	0.5- 2.0
c undulating	2.0- 5.0
d gently rolling	5.0- 9.0
e moderately rolling	9.0-15.0
f strongly rolling	15.0-30.0
g hilly	30.0-60.0
h very hilly	>60

ON-SITE SYMBOLS

Cirque
Escarpment
Major Channel
Minor Channel
Stream
Minor Channel with Stream
Gully
Avalanche Track
Debris Flow
Talus
Landslide Scar
Ⓖ Gravel Pit
Garibaldi Hazard Area (Potential Geological Hazards)
③ Terrain Note

IMPACT RATING

H high
M moderate
L low

HAZARD

1 rockslides, rockfall
2 slumps and slides
3 avalanches (snow)
4 gullying
5 surface erosion
6 flooding

CONSTRAINT

d poor drainage
o organics
r rock outcrop
s excessive slope
t texture (fine or very coarse)

TERRAIN NOTES (See maps for location)

1 High potential for erosion and slope failure associated with access road construction.
2 Extremely steep, rugged terrain with high erosion potential due to slope failure and rockfall.
3 Moderate potential impacts apply only to compaction of silty soils.
4 Major, active debris and rock slides associated with bedrock structural weakness.
5 Major geological fault zone characterized by extreme topography, unstable rock faces and extensive talus aprons.
6 Periglacial processes associated with freeze-thaw cycle are important erosive factors in this alpine environment.
7 Massive rock and debris slides and avalanches occur along extremely steep headwalls of ridges.
8 Extremely steeply sloping, serrate mountain ridge, sculpted by cirques and subject to rockfall, debris slides and avalanches.
9 High potential for surface erosion due to coarse textures and steep slopes of gullied unit.
10 Mountain sides are dominated by extremely steeply sloping, fractured bedrock outcrops and are subject to frequent avalanche activity.
11 Steep terrain subject to accelerated erosion by gullying and mass wasting.
12 Extremely steep, ruggged terrain subject to mass wasting processes including snow and debris avalanching, debris flows and rockfall.
13 Steep terrain with extreme frequency of snow avalanching.
14 Some sites are subject to depositional hazards from mass wasting or snow avalanching.
15 Locally steep sites with coarse textured soils may be very difficult to revegetate following disturbances.
16 High potential impacts apply only to avalanche areas.
17 High potential impacts apply only to steep talus slopes.
18 Surface erosion occurs along existing ROW.
19 Slide rubble field extends onto the floodplain.
20 High potential impacts apply only to active component of the floodplain in areas of recent channelling.
21 Terrain stability problems on highway cutbanks.
22 Moderate potential impacts apply only to steeply sloping bedrock component.
23 Inclusions of weak, erodible chloritic and/or serpentine rock outcrops.
24 Slide debris consisting of huge blocks of rock from Green River Slide; potential for further slides.
25 Hummocky basalt flows with ponded depressions and vertical scarps along the flow edges.
26 Civil defence zone (Garibaldi Hazard Area) designated by Order-in-Council 1409 within which land use is controlled due to hazards associated with geological and hydrological features of the Rubble Creek Valley.
27 Potential for flash flooding and fan scouring.
28 High potential impacts apply only to talus slopes at the margin of the floodplain.
29 Disturbance to discontinuous silty veneer could result in surface erosion.

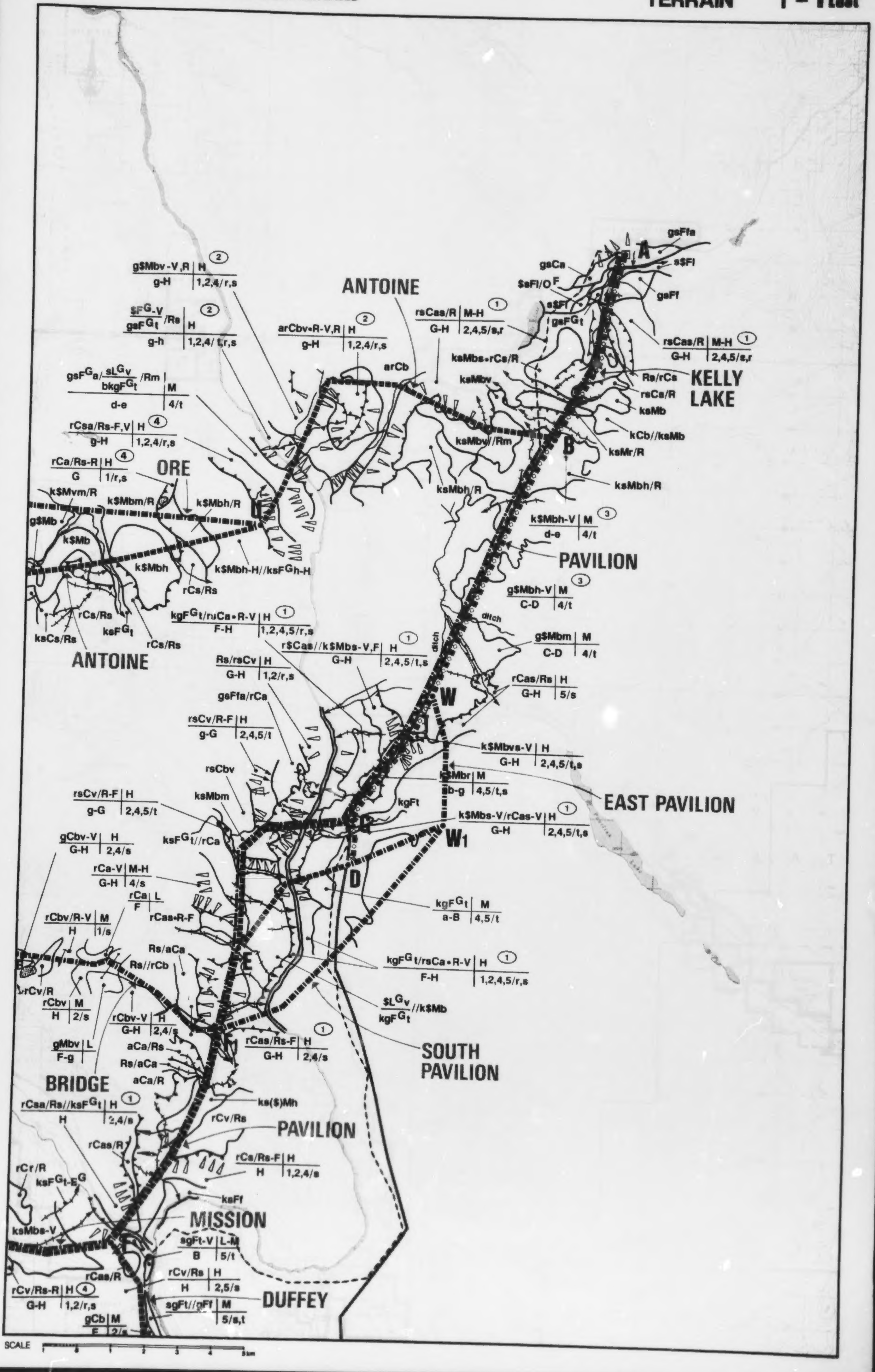
1990 Additions: based on aerial reconnaissance and photo interpretation only.

1A Terrain hazards appear to be low.
1B Some areas of moderate and high terrain hazards from debris flows or slides occur along the route.
1C Some areas of moderate terrain hazards occur along the route.

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

FRASER RIVER

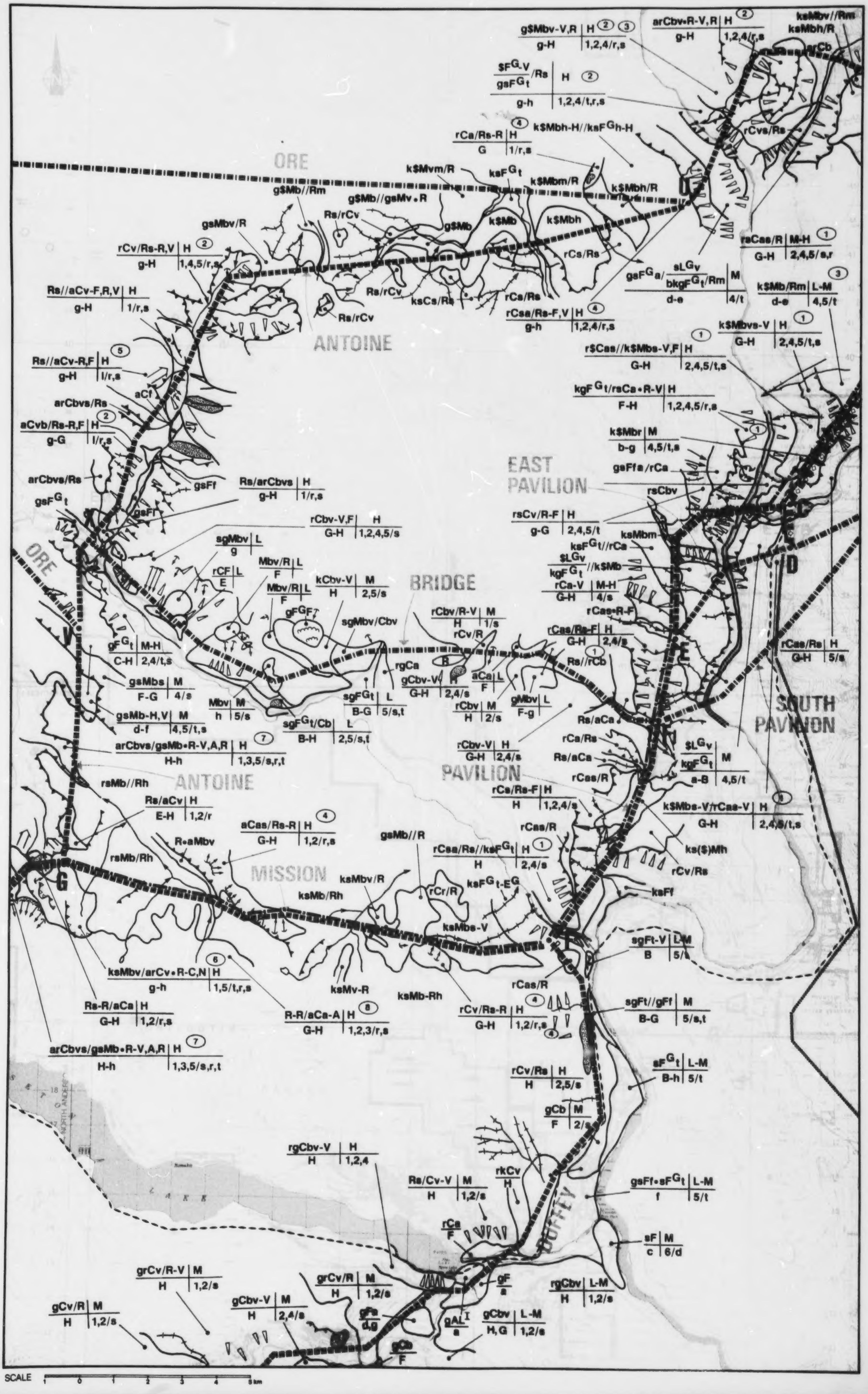
TERRAIN I - 1 East



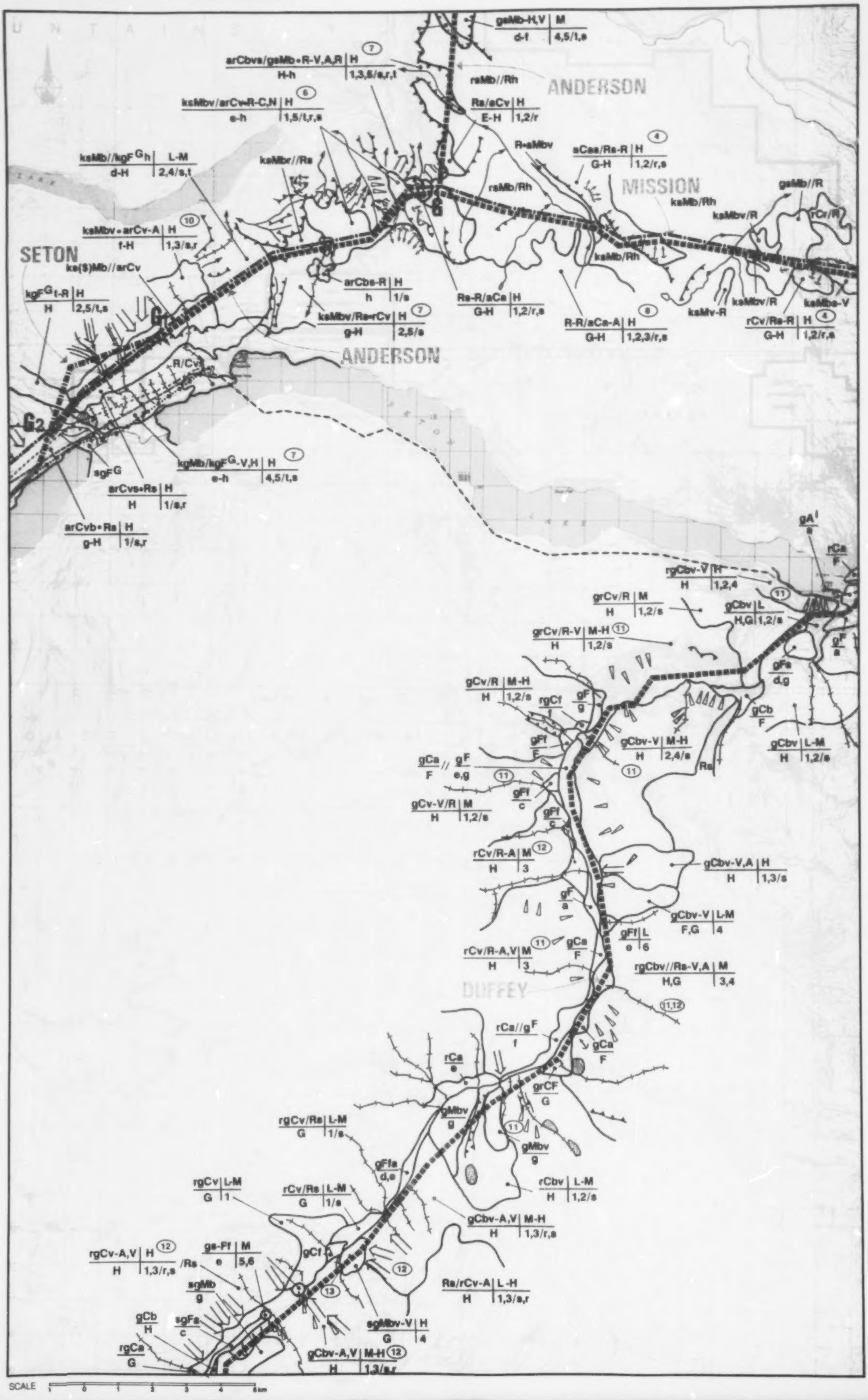
KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

BRIDGE RIVER

TERRAIN I-2


ORE
ANTOINE
EAST PAVILION
BRIDGE
PAVILION
SOUTH PAVILION
MISSION
DUFFEY
NORTH ANDERSON
LAKE
g$Mbv-V,R | H ② ③ / g-H | 1,2,4/r,s
arCbv•R-V,R | H ② / g-H | 1,2,4/r,s
ksMbv//Rm
ksMbh/R
arCb
$FGtV/Rs / gsFGt | H ② / g-h | 1,2,4/t,r,s
rCa/Rs-R | H ④ / G | 1/r,s
k$Mbh-H//ksFGh-H
rCvs/Rs
k$Mvm/R
ksFGt
k$Mbm/R
k$Mbh/R
g$Mb//Rm
g$Mb//gsMv•R
gsMbv/R
Rs/rCv
g$Mb
k$Mb
k$Mbh
rCv/Rs-R,V | H ② / g-H | 1,4,5/r,s
rCs/Rs
rsCas/R | M-H ① / G-H | 2,4,5/s,r
Rs//aCv-F,R,V | H / g-H | 1/r,s
ksCs/Rs
gsFGa/sLGv/bkgFGt/Rm | M / d-e | 4/t
k$Mb/Rm | L-M ③ / d-e | 4,5/t
rCsa/Rs-F,V | H ④ / g-h | 1,2,4/r,s
k$Mbvs-V | H ① / G-H | 2,4,5/t,s
Rs//aCv-R,F | H ⑤ / g-H | 1/r,s
r$Cas//k$Mbs-V,F | H ① / G-H | 2,4,5/t,s
aCf
arCbvs/Rs
kgFGt/rsCa•R-V | H / F-H | 1,2,4,5/r,s
aCvb/Rs-R,F | H ② / g-G | 1/r,s
k$Mbr | M / b-g | 4,5/t,s
arCbvs/Rs
gsFf
gsFfa/rCa
Rs/arCbvs | H / g-H | 1/r,s
rsCbv
gsFGt
gsFf
rsCv/R-F | H / g-G | 2,4,5/t
rCbv-V,F | H / G-H | 1,2,4,5/s
ksMbm
sgMbv | L / g
ksFGt//rCa
$LGv/kgFGt//k$Mb
rCF | L / E
Mbv/R | L / F
Mbv/R | L / F
kCbv-V | M / H | 2,5/s
rCa-V | M-H / G-H | 4/s
gFGF
sgMbv/Cbv
rCbv/R-V | M / H | 1/s
rCas•R-F
rCv/R
rCas/Rs-F | H / G-H | 2,4/s
rCas/Rs | H / G-H | 5/s
gFGt | M-H / C-H | 2,4/t,s
rgCa
Rs//rCb
gCbv-V | H / G-H | 2,4/s
aCa | L / F
gsMbs | M / F-G | 4/s
sgFGt | L / B-G | 5/s,t
rCbv | M / H | 2/s
gMbv | L / F-g
Rs/aCa
Mbv | M / h | 5/s
gsMb-H,V | M / d-f | 4,5/t,s
sgFGt/Cb | L / B-H | 2,5/s,t
arCbvs/gsMb•R-V,A,R | H ⑦ / H-h | 1,3,5/s,r,t
rCbv-V | H / G-H | 2,4/s
rCa/Rs
Rs/aCa
$LGv/kgFGt | M / a-B | 4,5/t
rsMb//Rh
Rs/aCv | H / E-H | 1,2/r
rCas/R
rCa/Rs-F | H / H | 1,2,4/s
k$Mbs-V/rCas-V | H / G-H | 2,4,5/t,s
R•aMbv
aCas/Rs-R | H ④ / G-H | 1,2/r,s
gsMb//R
rsMb/Rh
rCas/R
ks($)Mh
rCas/Rs//ksFGt | H ① / H | 2,4/s
ksMbv/R
rCv/Rs
ksMb/Rh
rCr/R
ksFGt-EG
ksFf
ksMbs-V
sgFt-V | L-M / B | 5/t
ksMbv/arCv•R-C,N | H ⑥ / g-h | 1,5/t,r,s
ksMv-R
ksMb-Rh
rCas/R
Rs-R/aCa | H / G-H | 1,2/r,s
R-R/aCa-A | H ⑧ / G-H | 1,2,3/r,s
rCv/Rs-R | H ④ / G-H | 1,2/r,s
sgFt//gFf | M / B-G | 5/s,t
arCbvs/gsMb•R-V,A,R | H ⑦ / H-h | 1,3,5/s,r,t
rCv/Rs | H / H | 2,5/s
sFGt | L-M / B-h | 5/t
gCb | M / F | 2/s
rgCbv-V | H / H | 1,2,4
rkCv / H
Rs/Cv-V | M / H | 1,2/s
gsFf•sFGt | L-M / f | 5/t
rCa / F
sF | M / c | 6/d
grCv/R-V | M / H | 1,2/s
grCv/R | M / H | 1,2/s
gF / a
rgCbv | L-M / H | 1,2/s
gCv/R | M / H | 1,2/s
gCbv-V | M / H | 2,4/s
gFa / d,g
gALI / a
gCbv | L-M / H,G | 1,2/s
gCb / F
G
V
D
SCALE
1
0
1
2
3
4
5 km

CAYOOSH

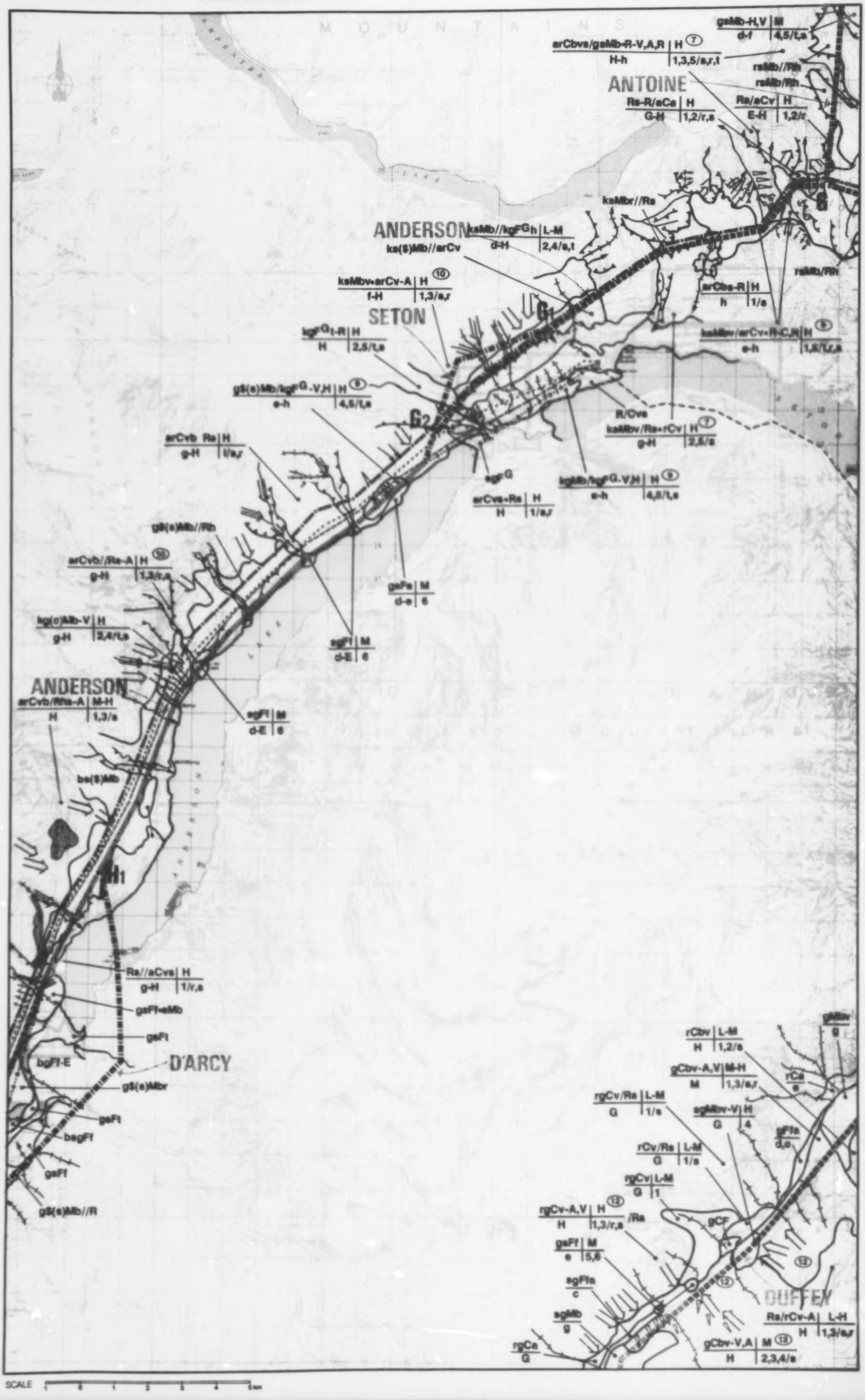

UNTAINS
SETON
ANDERSON
ANDERSON
MISSION
DUFFEY
G1
G2
gsMb-H,V | M
d-f | 4,5/t,s
arCbvs/gsMb•R-V,A,R | H ⑦
H-h | 1,3,5/a,r,t
rsMb//Rh
ksMbv/arCv-R-C,N | H ⑥
e-h | 1,5/t,r,s
Rs/aCv | H
E-H | 1,2/r
ksMb//kgF^G h | L-M
d-H | 2,4/s,t
ksMbr//Rs
R•aMbv
aCas/Rs-R | H ④
G-H | 1,2/r,s
rsMb/Rh
gsMb//R
ksMb/Rh
ksMbv/R
rCr/R
ksMbv•arCv-A | H ⑩
f-H | 1,3/s,r
ks($)Mb//arCv
kgF^G t-R | H
H | 2,5/t,s
arCbs-R | H
h | 1/s
ksMbv/Rs•rCv | H ⑦
g-H | 2,5/s
Rs-R/aCa | H
G-H | 1,2/r,s
ksMb/Rh
R-R/aCa-A | H ⑧
G-H | 1,2,3/r,s
ksMv-R
ksMbv/R
ksMbs-V
rCv/Rs-R | H ④
G-H | 1,2/r,s
R/Cv
sgF^G
kgMb/kgF^G-V,H | H ⑦
e-h | 4,5/t,s
arCvs•Rs | H
H | 1/s,r
arCvb•Rs | H
g-H | 1/s,r
gA^I
e
rCa
F
rgCbv-V | H
H | 1,2,4
grCv/R | M
H | 1,2/s
⑪
gCbv | L
H,G | 1,2/s
grCv/R-V | M-H ⑪
H | 1,2/s
gF
a
gFs
d,g
gCv/R | M-H
H | 1,2/s
rgCf
f
gF
g
gCb
F
gFf
F
gCbv-V | M-H
H | 2,4/s
⑪
Rs
gCbv | L-M
H | 1,2/s
gCa // gF
F e,g
⑪
gFf
c
gCv-V/R | M
H | 1,2/s
gFf
c
rCv/R-A | M ⑫
H | 3
gCbv-V,A | H
H | 1,3/s
gF
a
gCbv-V | L-M
F,G | 4
gFf | L
e | 6
rCv/R-A,V | M ⑪
H | 3
gCa
F
rgCbv//Rs-V,A | M
H,G | 3,4
⑪,⑫
rCa//g^F
f
gCa
F
rCa
e
grCF
G
gMbv
g
⑪
gMbv
g
rgCv/Rs | L-M
G | 1/s
gFfa
d,e
rgCv | L-M
G | 1
rCv/Rs | L-M
G | 1/s
rCbv | L-M
H | 1,2/s
gCbv-A,V | M-H
H | 1,3/r,s
rgCv-A,V | H ⑫
H | 1,3/r,s
/Rs
gs-Ff | M
e | 5,6
gCf
⑫
⑬
Rs/rCv-A | L-H
H | 1,3/s,r
sgMb
g
sgMbv-V | H
G | 4
gCb
H
sgFs
c
rgCa
G
gCbv-A,V | M-H ⑫
H | 1,3/s,r
SCALE
1 0 1 2 3 4 5 km

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

ANDERSON

TERRAIN

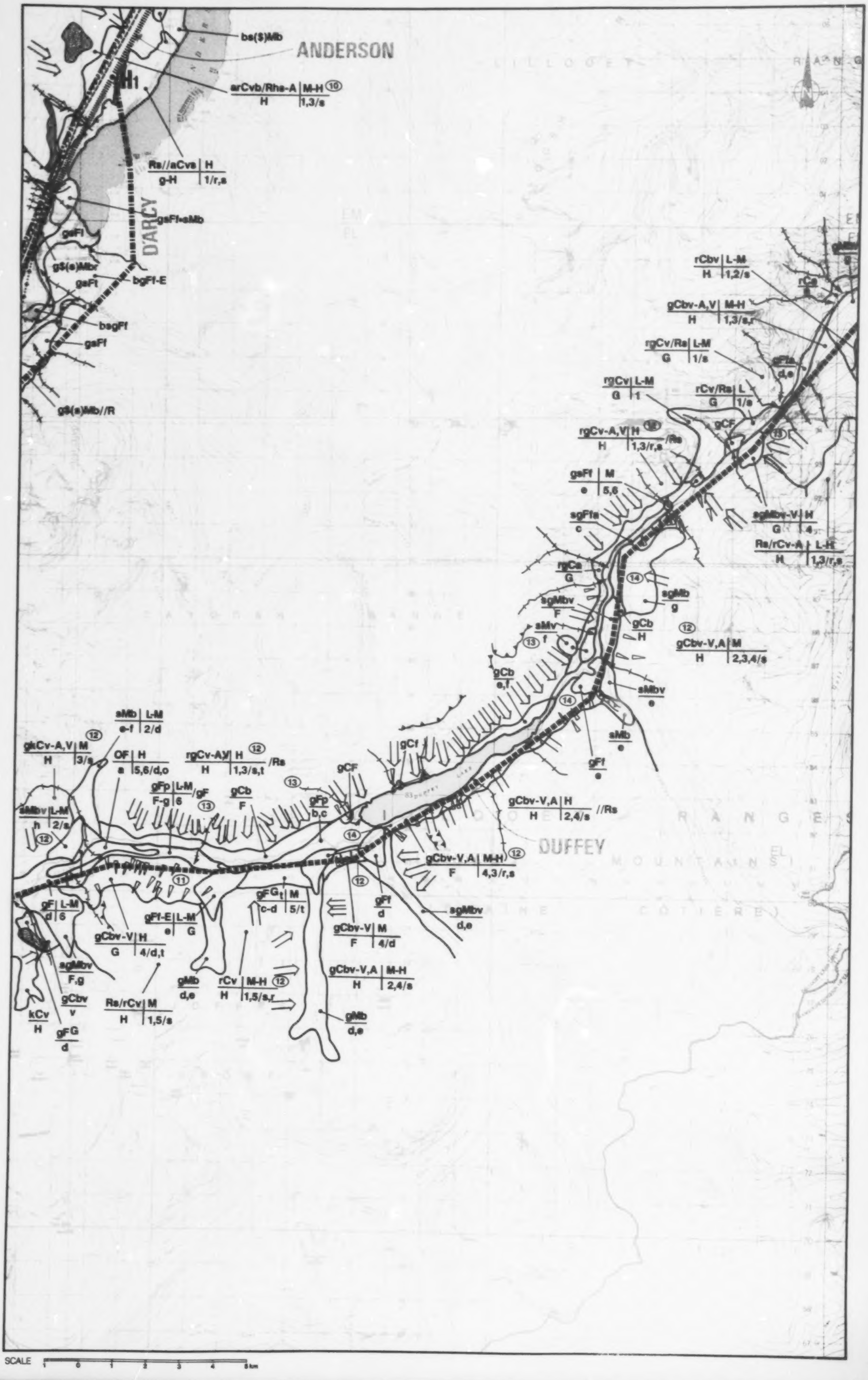
1 - 4 North



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

DUFFEY

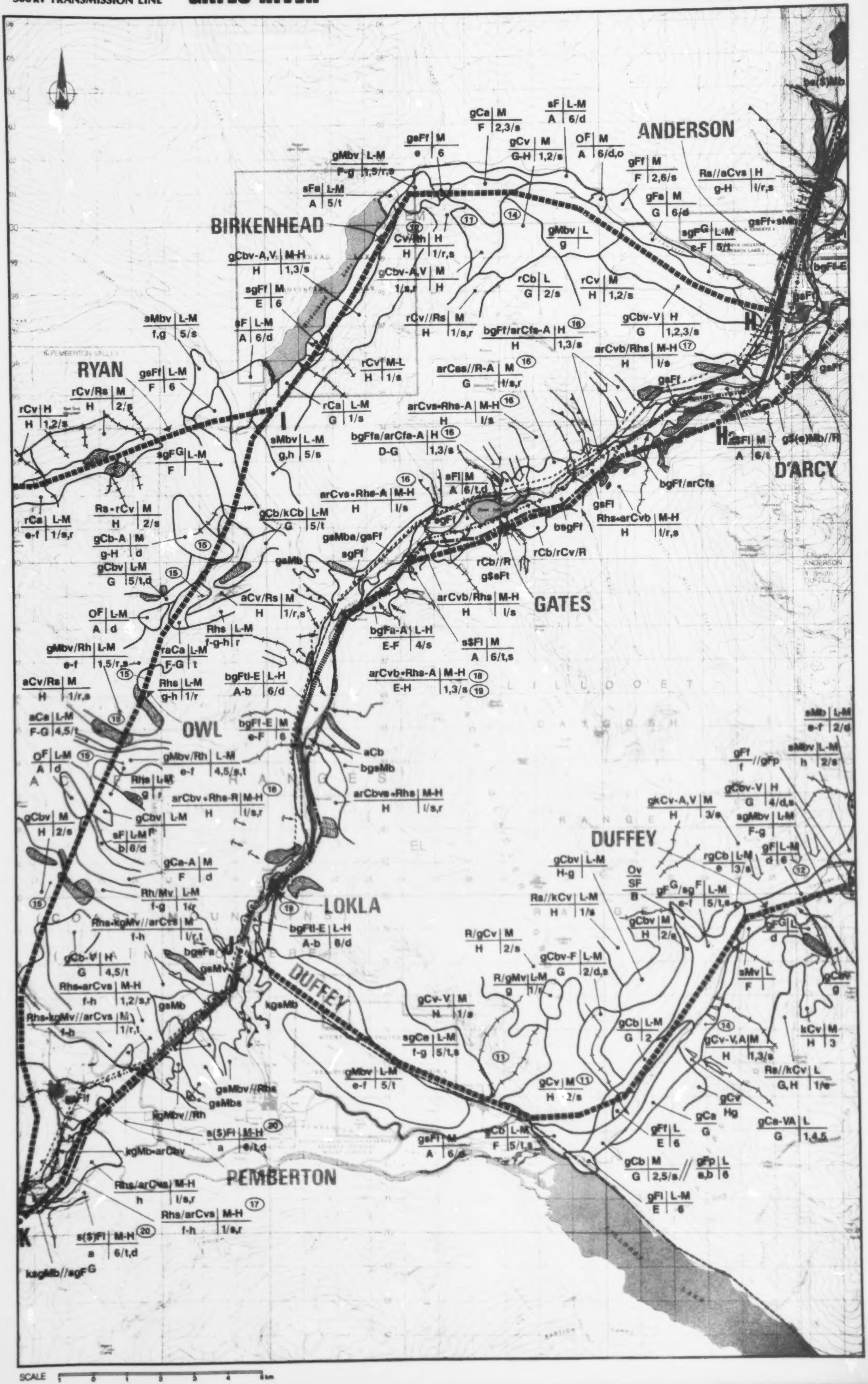
TERRAIN I - 4 South



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

GATES RIVER

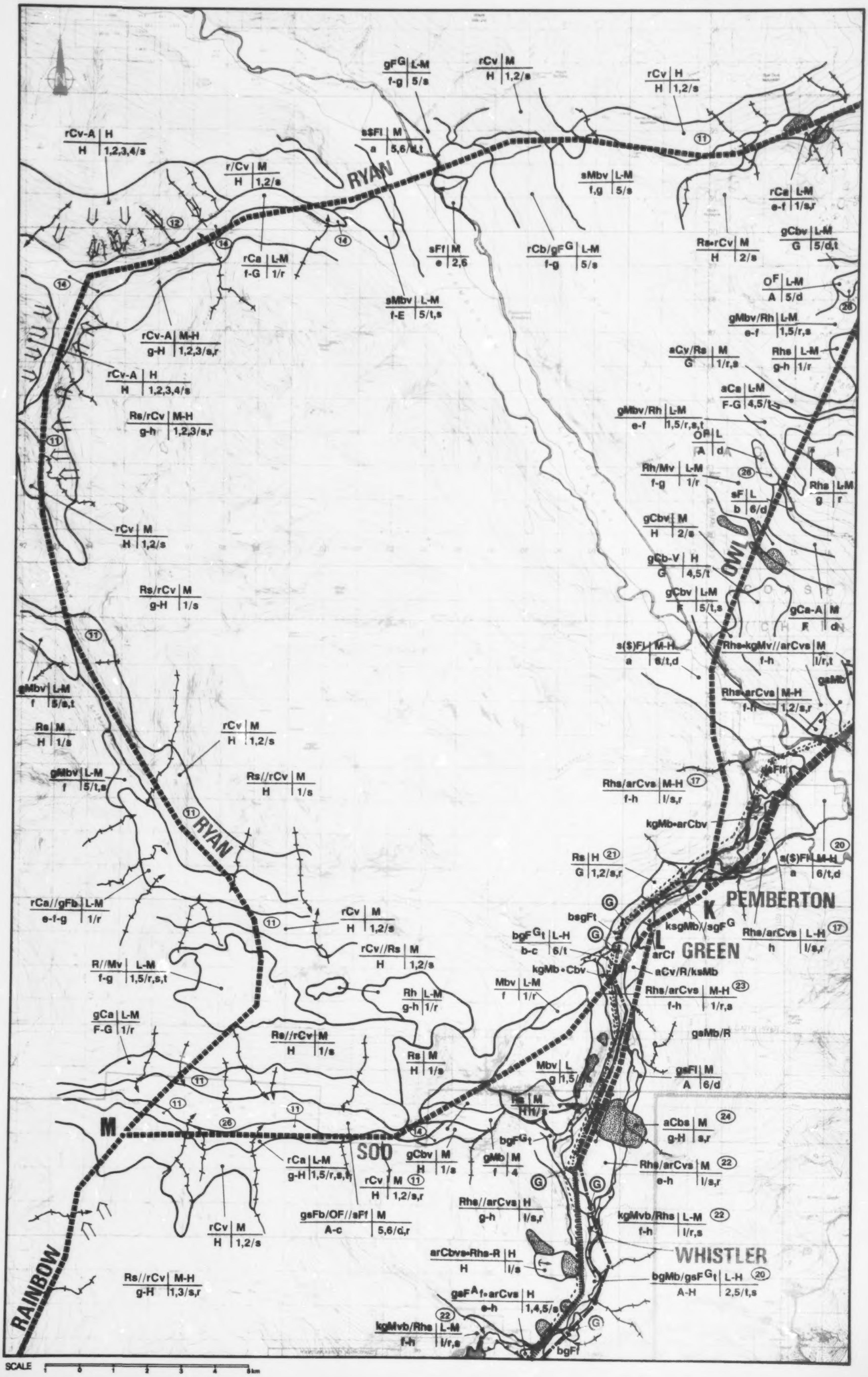
TERRAIN I - 5



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

PEMBERTON VALLEY

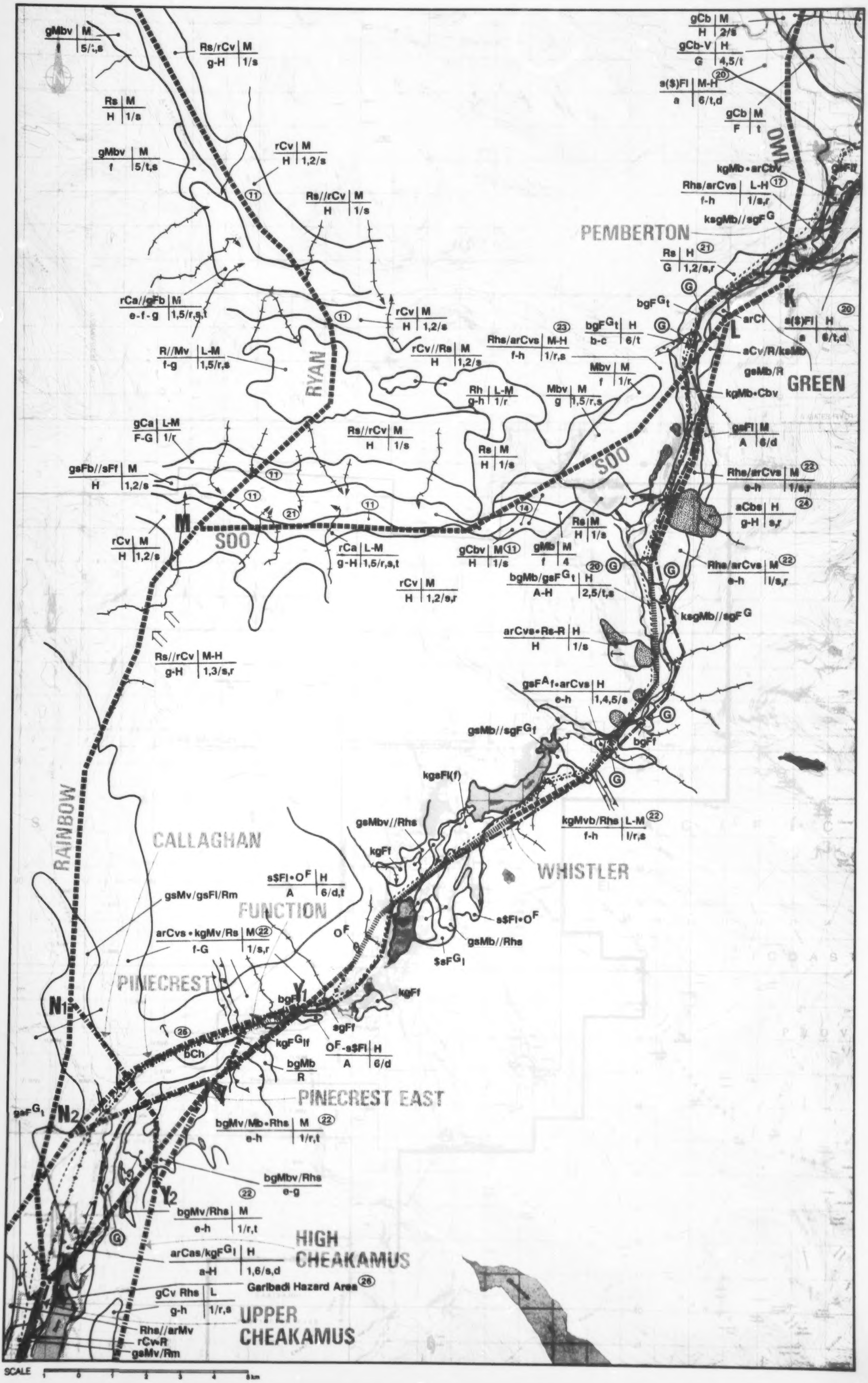
TERRAIN I - 6



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

WHISTLER

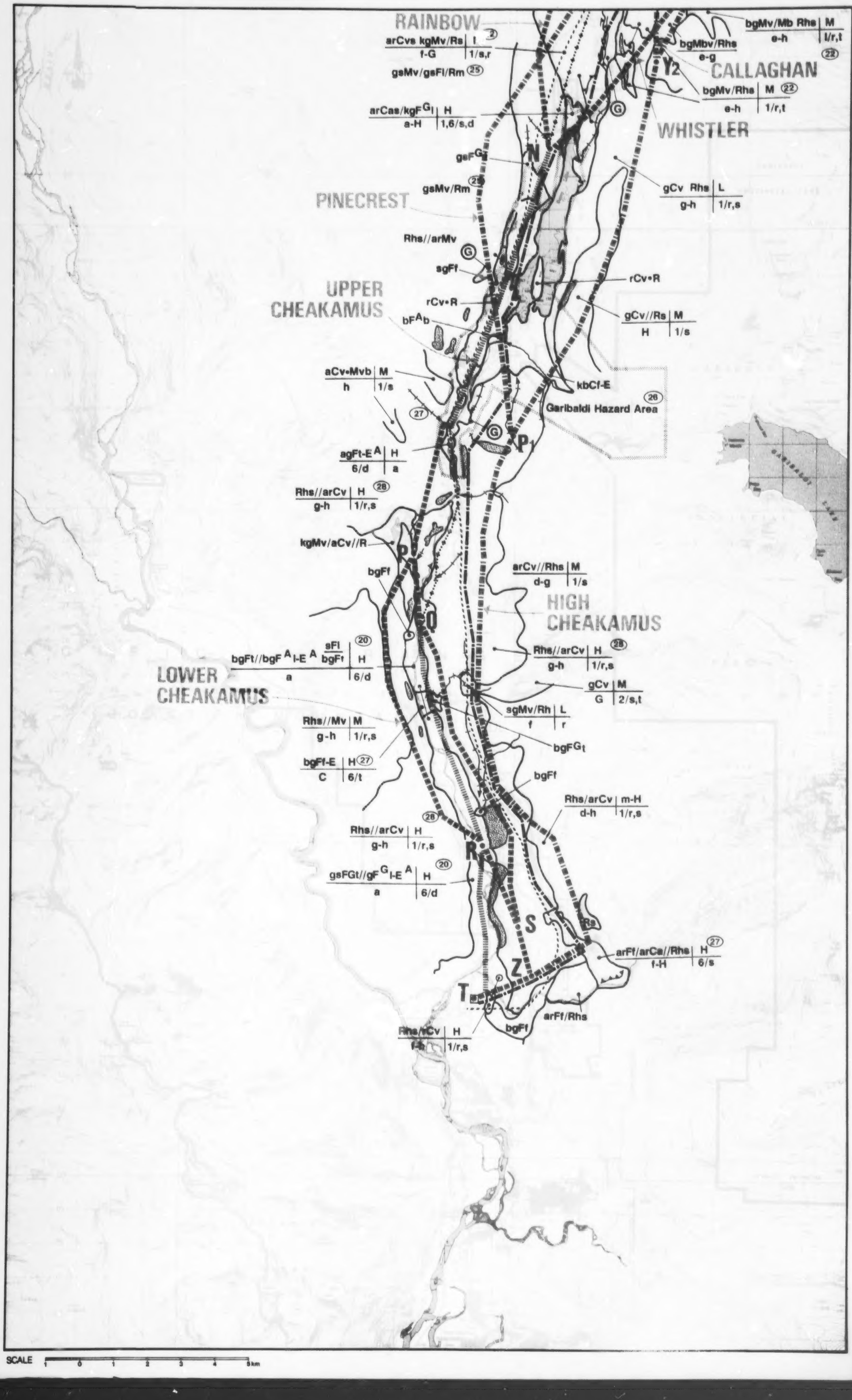
TERRAIN



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CHEAKAMUS

TERRAIN I - 8



II

LAND USE AND AGRICULTURE

LAND USE

Existing land use and settlement patterns reflect the Study Area's physiographic variations between Kelly Lake in the dry Interior Plateau and Squamish in the wet Coastal region. The Pemberton Valley is roughly the mid-point between Kelly Lake and Cheekye and is a suitable point to divide the Study Area into the North Sector (Interior) and South Sector (Coastal).

NORTH SECTOR

The North Sector is sparsely settled, due in large measure to rugged terrain conditions and low intensity resource development not capable of supporting large populations (ie. ranching, logging, and limited tourism/recreation). The 1986 Census population of this sector was approximately 3500, with the Village of Lillooet, adjacent fringe areas and the Lillooet Indian Band comprising about 65% of this total. Other small settlement areas include: the Diamond S Ranch headquarters north of Pavilion; Pavilion Village; scattered settlement along the Bridge River valley including the community at Moha; the native and non-native communities at Seton Lake Portage and Shalalth; the native and non-native communities at D'Arcy; and scattered rural residential development in the Birken and Gates Lake area.

In the past five to ten years, the population and level of development in this North Sector have been relatively stable, although the recession (from 1982 - 1988) had a significant dampening effect on the local economy.

SOUTH SECTOR

There are four significant settlement areas in the South Sector, including: Mount Currie; Pemberton and rural agricultural development in Pemberton Meadows; Whistler; and Squamish. There is also some recreation residential development south of Whistler in the Daisy Lake area (Pinecrest Estates and Black Tusk Village), as well as a considerable amount of rural residential development in the Cheakamus River valley north of Squamish.

The 1986 Census population of the South Sector was approximately 15,000 with the Squamish District Municipality comprising about 70% of this total. The economic base of the South Sector is much more diversified than the North Sector. Squamish, located at the head of Howe Sound, has an industrial economy (principally forestry). Over the past half decade, Squamish has been experiencing increased levels of development activity.

Whistler, on the other hand, is a resort community which has been experiencing a spectacular rate of development and investment. While its initial success has been as a winter ski resort, measures aimed at developing Whistler into a four-season world class destination resort are having success: this is having a profound effect on the social and economic character of the South Sector and to a lesser extent the entire Study Area. With the high volumes of visitor traffic being attracted to the area, other communities such as Squamish, Pemberton and Lillooet are taking initiatives to benefit from the increase in tourism.

A further spin-off effect has been the creation of job opportunities for residents of Pemberton, Mount Currie and D'Arcy. The high real estate values in Whistler have created a demand for new housing development in nearby communities such as Pemberton. In the Pemberton Valley, farming has been a traditional industry, with a number of residents engaged in logging, construction or sawmill activities. Until the growth of Whistler, there has been little development activity in Pemberton.

LOCAL GOVERNMENT

Local governments include both municipalities and regional districts. The four municipalities are: District of Squamish (Squamish); Resort Municipality of Whistler (Whistler); Village of Pemberton (Pemberton); and Village of Lillooet (Lillooet). Each of these four municipalities are located within the Squamish-Lillooet Regional District (SLRD) which encompasses most of the Study Area; its headquarters are in Pemberton. A small portion of the Study Area in the vicinity of Kelly Lake is located in the Thompson-Nicola Regional District (TNRD), with headquarters in Kamloops. The following is a brief statistical profile of each of the municipalities:

- Squamish (10,852 ha) - 1986 census population was 10,157; 1990 population estimate of 11,017.

- Whistler (12,632 ha) - 1986 census was 2,002; 1990 estimate was 2,828 permanent population and peak winter population of 3,875. The Whistler population figures do not provide an adequate indication of the total level of development due to the resort character of the community. Other key indicators of growth, to the end of 1988, are: 4900 residential units developed, including single family dwellings, condominium units, rental units and duplexes; tourist accommodation, including hotel, pension and hostel rooms, recreation vehicle and campground sites of 1,750 units; 41,200 sq.m of commercial space developed; and 33 full and self service restaurants.

  Extensive additional development took place in 1989 and 1990 in each of these land use categories.

- Pemberton (329 ha) - 1986 census was 347; 1990 population is estimated to be 470. There is also a concentration of semi-rural and agricultural residential development in the Pemberton Meadows area immediately north of the village boundaries.

- Lillooet (385 ha) - 1986 census was 1,758; 1990 population is estimated to be 1,723. A boundary extension study to include the "Hop Farm" area on the north edge of Lillooet and other fringe areas was carried out, but the initiative was defeated. The estimated population in the fringe areas under consideration is about 750.

NATIVE PEOPLE

The ten Indian Bands with interests in the Study Area are Pavilion, Fountain, Whispering Pines, Bridge River, Lillooet, Cayoose Creek, Seton Lake, Anderson Lake, Mount Currie, and Squamish. The Whispering Pines Band was formerly the Clinton Band and exchanged their Clinton IR2 and 2A reserves for a new reserve north of Kamloops. They retain Kelly Lake IR3 in the Fraser Canyon. The location of the reserves of the other Bands is shown on Series II map sheets.

The following is a brief statistical profile of each of the Bands based on Indian and Northern Affairs Canada 1991 information:

- Pavilion - total membership of 350; 246 on-reserve.
- Fountain - total membership of 665; 363 on-reserve.
- Whispering Pines - total membership of 91; 53 on-reserve.
- Lillooet- total membership of 231; 145 on-reserve.
- Bridge River - since 1985, the on-reserve population has increased dramatically to an estimated 141, and is expected to increase further as housing becomes available. The Band has a housing shortage, and is planning to add substantially to the housing stock in the near future as funding becomes available; the total band membership is 262.
- Cayoose Creek - total membership of 179; 34 on-reserve.
- Seton Lake - total membership of 467; 208 on-reserve. There is a trend to an increasing proportion of on-reserve residency resulting in a strong demand for additional housing. In recent years, the Band has experienced a dramatic increase in employment levels (80% employment), thereby further attracting off-reserve residents back to Seton Lake.
- Anderson Lake - total membership of 189 of which 91 are on-reserve. The Band is also experiencing a serious housing shortage, with a backlog demand of 20 units in the short-term and more in the long-term. They are aggressively pursuing a variety of economic development initiatives (eg. fisheries, forest products), and the level of unemployment among Band members has been dramatically reduced in recent years to near zero.
- Mount Currie - total membership of 1,361; 911 on-reserve.
- Squamish - total membership of 2,231; 1,504 on-reserve.

ECONOMIC DEVELOPMENT

The economy in much of the Study Area is experiencing significant growth and diversification, with tourism and recreation development being the leading contributors. A number of factors would indicate that this trend is likely to continue, including:

- Whistler's increasing popularity and success; it is likely to continue to attract a large amount of business investment, which will result in increased population and employment.
- The initiatives of the Sea to Sky Economic Development Commission and its member participants to encourage and facilitate economic development; members include Squamish, Whistler, Pemberton, Electoral Areas C and D of the SLRD, Anderson Lake Band and the Provincial Ministry of Regional and Economic Development. The Commission's areas of emphasis include tourism, port development, agricultural development, value-added forestry, and general diversification of the area's economy.
- Measures by the Ministry of Transportation and Highways to upgrade and increase the traffic capacity of Highway 99 between Squamish and Whistler, as well as paving of the Duffey Lake Road between Pemberton and Lillooet. Traffic volume forecasts prepared by the Ministry indicate significant increases due to the following:
  - Duffey Lake Road paving scheduled for completion in 1991. Peak summer flows are about 700 vehicles/ day. After paving, volumes are projected to increase to 3000/day during July/August, with the likelihood of peak flows on long weekends to about 4000/day;
  - Highway 99 between Squamish and Whistler traffic volume forecasts were not available from the Ministry, but the recent trend of increasing traffic volumes is likely to continue due to the attractions in Whistler and the planned highway upgrading.
  - Areas such as Pemberton and D'Arcy are attracting interest for seasonal and permanent residential developments.
  - Many of the Indian Bands are aggressively pursuing economic development initiatives to create employment and business opportunities for Band members.
  - The Ministry of Parks is considering development of a number of additional Provincial Parks in the region, thereby adding to the area's attractiveness and increasing tourism.
  - Increasing popularity of the region for a wide range of outdoor recreation activities, including heli-skiing, nordic skiing, wilderness trekking and mountain climbing. The Ministry of Crown Lands is studying recreation opportunities in the Whistler-Pemberton back-country.

IMPACT POTENTIAL ASSESSMENT

In preparing the land use impact potential assessments, the following assumptions were made:

- Only incremental impact potentials were considered; those associated with existing transmission lines have not been specifically addressed. This is of particular importance in instances such as the existing route through the lower Cheakamus Valley;
- Only land use impact potential was considered. It was not possible to summarize or judge potential impacts related to land status, such as the "impacts" of securing additional ROWs through Indian Reserve lands;
- Both existing and potential land uses were considered;
- The possible benefits associated with relocation of existing ROWs in several areas (D'Arcy/Gates Valley, Pemberton, Whistler) were taken into account.

Impact potential was assessed based on the following criteria:

- Negligible - no appreciable adverse impacts on existing or anticipated land uses; at the time of the assessments no discussions of impact potential had occurred with Indian Bands.
- Low - low degree of impact on existing or anticipated land uses;
- Medium - medium degree of impact on existing or anticipated land uses; and
- High - high degree of impact on existing or anticipated land uses.

AGRICULTURE

The assessment of potential agricultural impacts associated with transmission line construction and maintenance, and the assumptions on which the assessment was based, were modified from the earlier studies. Table II-1 provides a summary of typical impacts and mitigation measures which were used for establishing impact potential ratings.

IMPACT POTENTIAL RATING

An impact potential rating was assigned to each land capability unit within the Agricultural Land Reserve (ALR) along the route segments. The ALR encompasses all the significant blocks of arable land in the vicinity of the route alternatives with very few exceptions. Qualitative impact potential ratings were assigned to capability class polygons, on the basis of improved (irrigated and drained) agricultural capability classes. In general, impact potential ratings were assigned on the following basis:

IMPACT POTENTIAL RATINGS	AGRICULTURAL CAPABILITY CLASS (IMPROVED)
Negligible	7
Low	5-6
Moderate	3-4
High	1-2

It is recognized that this approach will overstate impacts on higher capability, undeveloped land relative-moderate capability developed land, but only very minor areas of land in the first category

TABLE II-1
TYPICAL AGRICULTURAL IMPACTS RESULTING FROM TRANSMISSION LINE CONSTRUCTION AND MAINTENANCE

TRANSMISSION LINE ACTIVITY	AGRICULTURAL IMPACT[1]	MITIGATION OR COMPENSATION
ROW Clearance	Disruption of cropping operations Disruption of fencing	compensation repair fences
Access road construction	Loss of arable land	compensation
	Soil compaction and rutting	renovate soil
	Loss of range vegetation	restoration
	Crop loss	compensation
Tower construction	Loss of arable land	use free standing towers
	Crop loss	compensation
	Interruption of existing irrigation equipment	compensation to revise system
	Loss of options for future irrigation system design	location of towers to leave most design freedom
Vegetation control	Crop and animal loss from improper use of herbicides to control vegetation	site specific selective herbicide programs will avoid crop damage
Line Maintenance	Crop loss	compensation
	Soil compaction	prohibit use of heavy equipment off permanent access routes; renovate soil
Unexpected events (eg. surface erosion)	Soil loss	improve drainage; renovate soil

Note 1) Assumes construction in summer when ground is dry.

occur along the route alternatives. The qualitative aspect of the assignment of impact potential ratings was applied relating to:

- Transmission line construction and maintenance through arable lands generally would have a low-moderate impact on existing or potential agricultural use. In the Study Area the highest agricultural impacts would occur where sprinkler irrigation system movements and operational safety could be adversely affected by tower and line locations. This impact can often be avoided or reduced by shifting the alignment to property or field boundaries and by locating towers on non-arable lands adjacent to or between arable areas, so that fields are spanned.

- Direct, long-term impacts which can occur as the result of the loss of arable land for the provision of access roads, both within and outside an ROW. This impact often can be largely avoided by selective placement of the access roads and towers on non-arable land.

- Short-term impacts on arable lands result where soils are subject to compaction and/or erosion when disturbed by the use of heavy equipment used in transmission line construction and maintenance. These adverse effects can be largely mitigated by proper equipment handling and rehabilitating affected areas once the line is established.

- The setting of irrigation pipes within the electromagnetic field of a transmission line which could result in an induced current along the pipe. The current greatly increases metal corrosion particularly in aluminum irrigation pipe. In addition, labourers moving the pipe may be endangered. Automated irrigation systems are also subject to increased corrosion; further, their use is restricted by the placement of towers and guys which may interfere with transporting the system across a field.

- More indirect impacts which are associated with the loss of opportunity for the construction of farm buildings or other permanent installations on transmission line ROW, and potential damage to crops and livestock which could result from maintenance traffic or the use of herbicides in ROW vegetation control.

The highest agricultural impact potential in the Study Area is associated with lands classified as arable (classes 1 to 5). Transmission lines located on lands over Class 6 and 7 are considered to have no impact on agricultural cropping use as Class 6 lands are suitable only for grazing and Class 7 lands are non-arable. Although the establishment of a ROW over any lands restricts the future use of that land, particularly the ability to establish permanent structures, it is difficult to establish the degree to which this might affect an agricultural operation as alternative lands for uses other than cropping usually are available. The impact assessment for this study is limited to the determination of possible effects on the arable land resource, both for lands presently in production and lands which have been determined to be capable of sustaining crop production. Additional agricultural studies may be required during detailed project design to ensure that site specific impacts are avoided to the extent possible by refining the alignment according to property, ownership, field boundaries, and current and future land use.

In agricultural areas where cattle ranching relies largely on the availability of grazing lands, ROW clearing and maintenance may create a beneficial effect in that previously low capability forest land could be opened up and seeded to forage species which increases grazing capacity. Within the Kelly Lake to Seton Lake region, the clearing and establishment of new ROW could provide an increased grazing land base for some ranchers.

The removal of 2L1 may also result in the opportunity to convert land to agriculture. The towers and conductors would be removed, and the support legs excavated and cut off at a depth of 50 cm to allow for cultivation.

Map Series II shows the agriculture impact potential ratings for the route alternatives which were studied, and indicates the type of impacts where ratings are moderate or high. In assigning agricultural impact potential ratings the following assumptions were made:

- Existing access would be used where possible;
- Tower locations would avoid arable land (both cultivated and not cultivated) where non-arable land alternatives exist;
- Where an impact occurs as a result of transmission line activity, mitigation would be attempted by BC Hydro and/or compensation would be paid to the land holder, particularly with respect to longer term impacts; and
- Agricultural cropping activities are allowable uses on the ROW with the only exception being tree fruit and nut production utilizing standard trees (rather than dwarf varieties).

Potential impacts presented by the spread of noxious weeds and damage of sensitive crops by pesticides can be largely eliminated by careful implementation of the construction and vegetation control programs. Construction vehicles should be steam cleaned at the previous site before they are brought to a new site if they have come from areas where weed sources exist; monitoring and spot spraying should be carried out for a period of a few years following construction.

1989 NETWORK

This section describes the land use and agriculture in the 1989 Network and assesses 5L46 impact potential.

KELLY LAKE (AB) - 6.0 KM

Land Use
Due to the steep topography, land use impact potential in the Kelly Lake (AB) segment is limited to the narrow Kelly Creek valley. The only area of potential concern is the valley bottom land which once formed part of Clinton IR #2, but were acquired by BC Hydro in 1972 for the Kelly Lake substation. In addition, BC Hydro has already acquired ROW for segment AB. The northern portion of segment AB lies within the Thompson-Nicola Regional District. Only one water source is licenced for water withdrawal: BC Hydro holds a licence on Kelly Creek and is allowed to withdraw 17,590 cubic m for irrigation purposes, as a result of acquiring lands for the Kelly Lake substation.

The overall land use impact potential of segment AB is negligible-low.

Agriculture
The Kelly Lake substation is located within a large, linear block of ALR land that lies along the valley bottom. The route cuts across approximately 1 km of moderate capability ALR land (Class 3 and 4) with irrigation. Less than half of the agricultural land is used for non-irrigated pasture and hay, a narrow strip of which is presently spanned by the existing transmission lines. Minimal additional, long-term impacts are expected provided that towers are located outside of the crop lands. Short-term, construction period impacts due to temporary access requirements may occur and would require compensation if they interfered with agricultural production and use.

From where the route leaves the ALR to ascend the mountain slopes to node B (approximately 5 km), it lies within the Minch Creek grazing subunit, which is under tenure to two ranchers: H. Wells holds a grazing permit for 103 head, from June 1st-October 15th; and Z. and E. Berghemen hold a permit for 75 head from May 16th-October 15th. Adverse rangeland impacts are not expected and within the ROW, grazing could be improved with the removal of forest cover and seeding to a range seed mix. Care should be taken during ROW clearing to ensure that any forest debris is removed or burned, especially from pine trees.

The overall agricultural impact potential in segment AB is low.

PAVILION (BCEF) - 29 .3 KM

Land Use
The Pavilion (BCEF) segment is adjacent to the existing transmission line corridor and therefore all potential concerns would be incremental. Significant land use/status features include:

- Diamond S Ranch lands (alienated land) at the northern end of segment BCEF;
- Pavilion IR 1 - the route traverses the reserve, although it is not in close proximity to Pavilion Village adjacent to Highway 12. Although it would appear that the addition of 5L46 to the existing corridor would not have any appreciable impact on the Band's community development planning, this has not been confirmed since no meeting with the Pavilion Band has occurred to date to discuss this aspect of the project;
- Bridge River IR 1 - Node F lies within Bridge River IR 1. On either side of node F, there could be some minor incremental impact (in addition to the existing line) on a small benchland area in the near vicinity with potential for two or three new dwelling units.

Seven sources licenced for water withdrawal are located in close proximity to segment BCEF. Pavilion Creek, which supplies over 3.6 million cubic m of water to the Diamond S for irrigation purposes, is the most significant of these sources. Water supplies are used for domestic, irrigation and industrial purposes by seven licencees.

The overall land use impact potential of segment BCEF is low.

Agriculture
Approximately 12 km of segment BCEF transect a large ALR unit which covers most of the undulating upland plateau to the north-east of the confluence of the Pavilion and Fraser rivers. The largest and most significant agricultural operation in the entire Study Area, the Diamond S Ranch, is situated in segment BCEF. This ranch, located between Kelly Lake and Pavilion on the east side of the Fraser River, encompasses most of the extensive ALR unit of the plateau, and extends to the south side of the Pavilion River, including most of the arable lands on the east side of the Fraser south to Fountain IR 3. The arable lands of this parcel are dominantly Class 2 and 3 with climatic, stoniness and topographic limitations. The fringe areas of the unit are Class 6 and 7 with topography and stoniness limitations.

The Diamond S includes 2400 ha of deeded land, supports 500 - 700 cows, 125 heifers, and bulls, and produces grass/legume hay, alfalfa, and some coarse grain hay which is grown when haylands are renovated and reseeded. Of approximately 400 ha of cultivated land, 160 ha are irrigated. Most of the cultivated land is located on the medium-textured morainal soils of the plateau between Kelly Creek and Pavilion. Other cultivated and irrigated areas belonging to the Diamond S are on the glaciofluvial terraces on the east side of the Fraser, a small portion of which would be impacted by the route depending upon the location of the towers and the height of the lines.

The ranch also holds grazing tenure rights to 6,000 ha of Crown range in addition to its deeded range. Most of the Crown range lies to the north, east, and south of the ranch and consists of an approximately equal mix of forested and open range. Existing transmission lines and logging have resulted in considerable clearing, and much of the open range has been improved by seeding. The Diamond S Crown rangelands are in the Pavilion subunit, totalling 524 head from May 1st-October 31st, and in the Tom Cole Mountain range unit with a permit for 150 head from May 15th-October 31st. At present, BC Hydro transmission lines cross the major hay and grazing fields of the ranch, and the towers present a serious obstacle to irrigation. The construction of 5L46 within the existing unoccupied ROW could result in additional impacts to the irrigation system and hay production, unless the siting of towers can be adjusted to the irrigation system at the time of detailed design.

Of prime concern to the ranch owner is the removal of more timber from the ranch's watershed. The irrigated acreage of the ranch has been decreasing in recent years because supplies have been reduced as a result of the diminishing water storage capacity of the watershed, which is attributed to the effects of logging. The use of herbicides to control ROW vegetation could cause damage to alfalfa stands; but since the surrounding area is open range there should be little need for vegetation control.

The route crosses the northerly boundary of Pavilion IR 1 about 5 km east of the Fraser River and transects benchlands of low capability, lying within the ALR (provincial ALR legislation does not apply to Indian Reserves). The portion of the reserve that would be affected by this route consists of open rangeland used for grazing. Past access road construction within the reserve related to the existing BC Hydro transmission lines has led to a considerable amount of disturbance within the ROW and erosion along cutbanks. If segment BCEF is utilized, consideration should be given to the rehabilitation of these disturbed areas, along with any additional areas disturbed areas by construction.

Segment BCEF avoids the cultivated farm land and associated activity on the bench to the west of the Fraser, but does cross some dry rangeland; impact potential would be low.

The overall agricultural impact potential for segment BCEF is moderate.

FRASER SUBOPTION (CDE) - 5.8 KM

Land Use

There are no significant residential or related land uses or potential impacts associated with the Fraser (CDE) suboption.

Agriculture

On the east side of the Fraser River, south of Pavilion and node C, suboption CDE travels south along the lower mountain slopes through 2 km of the Tom Cole Mountain Crown range unit before entering the private lands along the river. No adverse impacts are expected on the rangelands and some improvement in production may be possible within the ROW if seeded to appropriate grasses.

The terraces along the east side of the Fraser, at the point at which the route turns west to cross the river, are high capability, privately held lands within the ALR. Several irrigated hay fields have been developed on the terraces. The route is upslope of the first field, and between two lower fields. With this alignment and careful tower placement it should be possible to avoid adverse effects on both the developed and undeveloped lands. No access should be required within the field areas.

After crossing the Fraser the route passes through approximately 1.5 km of high capability, privately held ALR lands. Two fields located on these benchlands are used for irrigated forage production. The balance of dry land in the ALR parcel is used for non-irrigated grazing. The route travels at an angle across the pasture and irrigated fields and the impacts due to line construction and maintenance could be high in this area if towers are placed within them. It appears that the irrigated field could be spanned, and new access should not be constructed within the fields. Tower location within the pasture area would result in the loss of a minor extent of this land, and would limit future irrigation system design.

The overall impact potential for suboption CDE is assessed as moderate.

ANTOINE (BG) - 44.3 KM

Land Use

The Antoine (BG) segment, in which there are no transmission lines, would bypass the Diamond S Ranch, Pavilion IR 1, and Bridge River IR 1. Most of the route is comprised of rugged terrain with no existing or potential land use impacts except:

- Kelly Creek Crossing - DL 3638 is alienated land;
- Kelly Lake IR 3 - located on the east bank of the segment BG Fraser River crossing. This unoccupied reserve belongs to the Whispering Pines Band, (formerly the Clinton Band). The route would pass near its eastern side and remove the sense of isolation of this remote fishing camp;
- Antoine Creek Valley - DL 3223, which is alienated land, would be traversed by 5L46; it is the site of an isolated small alternative lifestyle community surrounded by steep terrain;
- UREP Reserve - in Antoine Creek Valley between DL 3223 and the Bridge River;
- Bridge River Valley - DL 3222 (alienated land) would be traversed by 5L46. West of the Bridge River crossing is further alienated land (Moha area) with rural settlement. Through the public consultation process, the residents in this area (Yalakom Ecological Society and others) have registered their adamant opposition to this route, principally due to the perceived negative impact 5L46 would have on the environmental integrity of their settlement and the surrounding area.

Antoine Creek and McKay Spring are the two water supply sources within segment BG. Six licences, including the Lillooet Blue Ridge Ranch, Yalakom Residential Cooperative and Bridge River Band, utilize these sources for domestic, irrigation, power and storage.

The overall land use impact potential of segment BG is assessed as high.

Agriculture

Segment BG crosses the Minch Creek Crown range subunit for 4.5 km from node B to Kelly Creek. No ALR or arable lands occur within this section. No agricultural impacts are anticipated and range improvements would be possible through ROW seeding.

After crossing the Fraser River the route traverses deeded pasture and Crown rangelands of the Blue Ridge Ranch for a distance of about 7 km. The Crown range tenure held by the ranch consists of a grazing permit for 256 head from April 1st-October 15th on the Upper and Lower Swamp and Upper and Lower McKay subunits. The Blue Ridge also holds 3 grazing leases some distance to the south of the route where the ranch's hay meadows are located.

Along the Fraser River side-slopes the route passes through two ALR units of Crown land (DL 4690 and DL 2977). DL 2977 is part of the Lower Swamp grazing subunit. All of the lands have low agricultural capability (Class 5 and 6) and are forested rangelands used for grazing in conjunction with surrounding Crown range held under permit, and would not be adversely affected. Range improvements within the ROW would provide a net benefit for grazing.

In the DL 3223 community, there are several small, non-ALR fields supporting fruit trees, hay, pasture and vegetables, lying along the creek bottom, just east of the route. The community practices mixed farming and raises goats as well as other farm animals; water is taken from Antoine Creek. There are approximately twenty farms in the Yalakom Valley area which continue to oppose the use of pesticides on agricultural lands, roadsides, and forest areas. Many of the farms, including the one in Antoine Creek, have apparently been classified as pesticide-free, organic farms the produce from which is sold at a premium.

On the north side of the Bridge River crossing the route passes to the west of three small non-ALR pastures located on terrace/fan deposits of low agricultural capability. The route could be aligned to avoid any direct impacts on the agricultural lands. Potential adverse impacts on the farms in this area are those associated with the use of herbicides near and over any fruit and vegetable gardens. The community is very sensitive to the use of pesticides on transmission line ROWs because of their pesticide-free certification, and their concern for the purity of their water supplies.

After crossing the Bridge River, the route runs adjacent to the west boundary of Bridge River IR 1 on the river's south bank. No active agricultural activities occur within the reserve in close proximity to the route. On the south side of the Bridge River, the route passes through the Mission range unit on which F. Watkinson holds a 31 head grazing permit from May 20-September 30. No ALR or arable lands are located within this section of the route. Clearing and ROW seeding would increase range productivity within this area.

The overall agricultural impact potential of segment BG is assessed as low-moderate.

MISSION (FG) - 15.0 KM

Land Use

Aside from minor concerns within Bridge River IR 1 in the vicinity of node F, there are no features or potential impacts from the land use perspective in the Mission (FG) segment. Ama Creek is the only licenced water source in segment FG; the Department of Indian Affairs holds two licences for domestic and industrial purposes. A short section of land along the route within Bridge River IR 1 is suitable for rural residential development and would be restrained by the alignment of segment FG.

The overall land use impact potential of segment FG is assessed as low.

Agriculture

Node F and the first 1.75 km of segment BF lie within Bridge River IR 1, immediately west of the confluence of the Bridge and Fraser rivers. Within IR I, the route transects gently to moderately sloping glaciofluvial terrace and morainal deposits that have limited agricultural capability, small areas of which are pasture. Tower placement and access road construction would have little or no impact on the pasture areas but could restrict future agricultural development in this area.

The remainder of segment FG passes through the middle of the Mission range unit. The area has limited grazing potential due to steep, forested terrain along Mission Ridge. No negative agricultural impacts are anticipated within the forested range areas.

The overall agricultural impact potential of segment FG is assessed as negligible-low.

DUFFEY (FJ) - 89.0 KM

Land Use

The Duffey (FJ) segment is a route alternative to the combined Mission (FG), Anderson (GH) and Gates (HJ) segments. The relevant land use and community planning considerations are:

- Lillooet Indian Band - the route traverses extensive portions of Lillooet IRs 1 and 1A. Although the route is through lands that are not presently utilized, the line would be highly visible from the Lillooet Band village located on the bench adjacent to the Village of Lillooet.

- Lillooet - the route does not encroach on Village boundaries, but it would be highly visible from within the village. The Village Council strongly opposes the use of segment FJ for this reason and more importantly for the potential negative impact on Duffey Lake road tourism. Lillooet believes tourism is an important local economic development stimulus, and the road is considered to be a scenic tourist link between the Lower Mainland and Interior, with Lillooet acting as an important service centre.

- SLRD - the Regional District supports the Village of Lillooet's opposition to the use of segment FJ because of a concern for the potential negative impact on tourism, not only in Lillooet, but also in other parts of the Regional District, including the Pemberton area.

- Mount Currie Band - lands owned by the Mount Currie Band would be seriously affected by segment FJ, although 5L46 would be adjacent to 3L2. In Mount Currie IR 6, 5.7 km of new ROW would be required, with an additional 1 km of ROW required through IR 7. The Mount Currie Band has indicated to BC Hydro its opposition to segment FJ. In addition to additional ROW requirement, a major concern is the close proximity of the route to the Band's new village.

Of the nine sources licenced for water supply in segment FJ, four are of particular significance: Dickey Creek provides water to ten licencees, including waterworks systems operated by the SLRD and Lillooet; Town Creek also provides over 1.1 million l/day of water to Lillooet; and Seton River and Cayoosh Creek support a total of nine licences, mainly for power generation.

The overall land use impact potential of segment FJ is assessed as high.

Agriculture

Segment FJ originates within Bridge River IR 1 and traverses the easterly boundary of Lillooet IR 1A and through Lillooet IR 1, skirting the eastern boundary of the Mission range unit. Approximately 2 km north of Lillooet the route passes directly over a narrow field of irrigated forage on private ALR land adjacent to IR 1. The field is approximately 1.75 km in length and the existing transmission lines traverse its east boundary; it should be avoided if possible otherwise its utility for irrigated hay production would be severely diminished.

The only other areas of agricultural concern are where the route passes over Mount Currie IR 6 between the north end of Lillooet Lake and node J. It touches the corner of a small parcel of ALR developed for pasture, just outside the Mount Currie Reserve, and skirts another small ALR parcel that has been developed for forage, in the eastern portion of Mount Currie IR 6. These hay and pasture areas could be avoided with minor alignment shifts, in which case no adverse agricultural impacts would be expected.

The overall agricultural impact potential of segment FJ is assessed as low.

ANDERSON (GH) - 39.5 KM

Land Use

Important land use considerations in the Anderson (GH) segment are mainly in the communities of Shalalth/Seton Portage and D'Arcy. The route would be on the hillside well above both the Seton Lake Indian Band settlement and the non-native community at Shalalth. The route traverses the upper corner of Seton Lake IR 5A; 1600 m of new ROW adjacent to 5L42 would be required.

More significant is the potential release of 2L1 ROW which is at a lower elevation near the bottom of the valley; some of this ROW, which passes through both reserve and non-reserve lands, is suitable for community development. The Seton Lake Band is actively involved in a land use and infrastructure development planning program. The Band has high demands for additional housing (backlog of about 50 units with an additional demand of 5 units per year), while at the same time they have a very limited supply of suitable residential development land. The effective supply of suitable land is further limited by existing transmission lines on reserve lands, particularly Slosh IR 1 west of the powerhouse (2L1, 2L2, 3L2), as well as DL 1592 (2L1, 3L2) which the Band has recently acquired (located north of Necait IR 6).

Release of 2L1 ROW would be an advantage to the Seton Lake Band because it would make more land available for future development. As illustrated on Figure II-1 (p.37), a residential development cell has been identified on the easterly end of Slosh IR 1 (near the ball field), and this cell could be enlarged with release of the 2L1 ROW. In the newly acquired DL 1592, release of the 2L1 ROW would make available a considerable amount of suitable land. The Band is presently investigating the development potential of this additional reserve area. Potential uses include expansion of an existing campground (on Whitecap Creek), commercial cabins, and possibly residential development.

The release of 2L1 ROW would not be a significant factor in the non-native community as the land traversed is relatively steep. Any additional development on less-steep land south of 2L1 would consist of residential infill in existing development areas.

The route between Seton Portage and D'Arcy would use 2L1 ROW with no appreciable land use or development impacts (other than visual considerations).

The release of 2L1 ROW would benefit the Anderson Lake Band and the non-native community in D'Arcy in that some low-elevation lands would be made available. The Anderson Lake Band has substantial demands for new housing, although specific plans are not completed. A community plan is being prepared, and the Band has expressed a goal to integrate Reserve land planning with non-reserve lands in cooperation with the SLRD. In the Regional District's Official Regional Plan for the Pemberton to D'Arcy area, the vicinity of node H (Blackwater Creek/Gates River) is designated as a "residential settlement area". The development potential of this settlement area would be enhanced by the release of 2L1 ROW and the use of a route near 3L2, as such a release would remove a major planning constraint.

Twenty-nine brooks, springs, rivers and lakes within segment GH are licenced for water withdrawal, the most significant of which are the Seton River and D'Arcy Creek. The Bridge River, which BC Hydro has developed for power generation from Carpenter Lake, is included in this segment as the penstocks carrying water from Carpenter Lake cross under the route north of Shalalth. Thirty-two licencees draw water from these sources for a wide range of purposes, including domestic, irrigation, waterworks, conservation and power generation. Several licencees (i.e. Department of Indian Affairs) hold more than one licence. Numerous licenced water sources exist in the Shalalth/Seton Portage and D'Arcy areas, including not only the Seton/Anderson lakes system, but also numerous smaller brooks, springs and creeks.

The overall land use impact potential of segment GH is assessed as low.

Agriculture

Two agricultural areas along segment GH have been released from the ALR since the earlier studies: one at Seton Portage and the other at D'Arcy. Along the northwest shore of Anderson Lake there are six small clearings that have never been included in the ALR. Two, at DL 2662 and DL 8508, support irrigated tree fruits, while at DL 2662 there is a small clearing with non-irrigated tree fruits. At DL 1580, DL 1582, and DL 2662, there are small clearings probably used for pasture.

At the southwest end of Anderson Lake there is a small clearing supporting non-irrigated pasture. All the above agricultural fields lie very close to, or directly under, the route. Due to climate the area is highly favoured for orchards especially on the fluvial fan and terrace deposits at Seton Portage and D'Arcy and the morainal slopes and benches on the west side of Anderson Lake. Agricultural impacts would be low provided towers and access roads are not located directly on any of the clearings or on lands adjacent to the clearings that could be used for the expansion of cropping.

The agricultural operations along Anderson Lake are dependent on tributary streams and shallow wells for domestic and crop water and extreme care would have to be taken not to disrupt or contaminate these sources during line construction. There may be potential agricultural benefits resulting from the removal of 2L1 in the vicinities of Seton Portage and D'Arcy, where minor sections of the ROW might be suitable for small scale cropping similar to that occurring along Anderson Lake.

The overall agricultural impact potential on segment GH is assessed as negligible-low.

BIRKENHEAD (HI) - 20.0 KM

Land Use
The Birkenhead (HI) segment comprises part of a routing to bypass the Gates (HJ) segment. Noteworthy land use/status issues are:

- Birkenhead Lake Provincial Park - the route traverses through approximately 7 km of the park.
- Blackwater Creek Valley - scattered rural residential development on private land east of Blackwater Lake.
- Anderson Lake IR 5 - on north side of Blackwater Creek valley opposite the route.
- Birkenhead Lake - traverse of the eastern side of the lake would be in full view of recreation cottage development at lake's south end.

The route is on a steep hillside not presently developed and with no development potential; direct land use impacts would be minimal. Indirect impacts would be related to visual and aesthetic considerations (refer to Chapter V). The Anderson Lake Band, the SLRD and the Pemberton all strongly oppose use of segment HI; the concern is for the high tourism and recreational values in the Blackwater Valley and Birkenhead Lake Provincial Parks.

Thirteen licencees draw water from ten sources within segment HI; they include the Birkenhead Lake Estates (237,000 l/day for domestic use), Pemgold (455,000 l/year for a mining operation) and the Anderson Lake Band (15,100 cubic m for irrigation). Other licencees draw water predominantly for domestic consumption.

The overall land use impact potential of segment HI is assessed as low.

Agriculture
Segment HI passes to the south of a linear parcel of ALR land lying on the valley bottom between Blackwater and Birkenhead lakes. The area at the northeast end of Birkenhead Lake has been excluded from the ALR and is now a campground included in Birkenhead Provincial Park. The ALR portion upstream of Birkenhead Lake is used for pasture and forage, and significant clearing for agricultural cropping purposes has recently been carried out; agricultural impacts would be avoided with the route to the south of the ALR unit.

The overall agricultural impact potential of segment HI is negligible-low.

GATES (HJ) - 27.5 KM

Land Use
The northern two-thirds of the Gates (HJ) segment is comprised mostly of private land, with a considerable rural residential development. The presence of the railway, highway and four transmission lines (5L42, 3L2, 2L1, 2L2) on or near the valley floor results in considerable restraints on development and land use.

In the SLRD's Official Regional Plan for the area, existing and potential residential settlement areas are designated which generally correspond to the suitable development areas of the privately owned land. The Transportation and Utilities section of the plan addresses the issue of 5L46 stating that "... The Kelly Lake-Cheekye route, if approved, will pass through the Pemberton/D'Arcy corridor. Very little land is currently available for suitable settlement areas in this already over-utilized area and further utilization of utility routes may only overburden this area. Thus, B.C. Hydro should be encouraged to review all possible alternatives and choose the route which will have the least impact on the corridor". Further, the Regional Plan includes the following Policy: "The location of the B.C. Hydro single circuit 500 kV line shall be discouraged in areas designated as potential development sites in Schedule D of this plan".

The segment HJ routing would be supportive of this policy: the alignment would be removed from the valley floor through most of the areas designated for residential development; and the release of the 2L1 ROW would enhance the potential of these residential development areas.

With respect to the Lokla IR 4 near Creekside (a fishing site owned by the Mount Currie Band) there would be no incremental impact since the route would be on the 2L1 ROW. The Band has stated that it is concerned that provincially controlled utilities have limited the development potential of these reserve lands, although in this case the area traversed by the 2L1 ROW is covered by rock slide debris.

Seven licenced water sources supply are located within segment HJ. Clayton Brook, which supplies 13,650 l/day for domestic use, is the most significant; ten licencees withdraw water from these sources for domestic and irrigation use.

The overall land use impact potential of segment HJ is assessed as low.

Agriculture
South of D'Arcy, between node H and Gates Lake, there is one unit of ALR land which lies along the Gates River floodplain; it encompasses Nequatque IR 4 and the railway. This area is currently farmed and supports a small herd of cattle and hay is produced on naturally sub-irrigated pastures.

In this section of the valley, 5L46 would be located on the lower, southerly mountain slopes well off the floodplain and so that no adverse agricultural impacts should occur; 2L1 runs through this ALR land and would be removed as part of this project. The release of 2L1 ROW would provide a net benefit to agriculture in terms of the production potential of the ALR land, as well as from other floodplain lands within the current ROW that may be used for gardening or limited crop production.

The overall agricultural impact potential on segment HJ is assessed as negligible-low.

OWL (IK) - 25.0 KM

Land Use
The Owl (IK) segment is an extension of the Birkenhead (HI) segment. Land use impacts can be anticipated at the southerly end of segment IK where the route descends into the Lillooet River valley and crosses Pemberton Meadows. The valley bottom traversed by this route consists of private farm land within the ALR. There is also rural residential development in the area north of the Village of Pemberton.

5L46 on this route would be a prominent feature, visible from residential areas in Pemberton and the rural residential neighbourhood on the meadows north of the village. Concern for this impact on the community of Pemberton is the main reason for both Pemberton and the SLRD expressing opposition to segment IK. Near the junction of segment IK with the existing line corridor at node K, the route crosses Nairn Falls Provincial Park west of the campground; combined with the highway crossing near the entrance to the park, this would have a visual impact, thereby detracting from the attractiveness of the park.

Pemberton Creek is the only licenced water supply source within segment IK. It is, however, of significance as both Pemberton and the Pemberton North Improvement District hold licences to draw over 774,000 l/day from Pemberton Creek to operate waterworks systems.

The overall land use impact potential in segment IK is assessed as moderate.

Agriculture
The Pemberton Valley is a very important agricultural area. Most of the fluvial soils of the valley have been dyked and drained and are cultivated for seed potatoes, vegetables, and forage for beef production. Segment IK crosses the Pemberton Valley on an angle, immediately northwest of Pemberton. The route traverses about 2 km of high capability, deeded agricultural land within the ALR, primarily used for beef cattle grazing and forage production; tower locations within the fields would limit agricultural production opportunities but it should be possible to align the route so that towers can be located along the margins of low productivity or non-productive areas. No permanent access should be constructed within the fields and temporary roads should be carefully reclaimed. As in all productive agricultural areas, construction timing should try to accommodate the cropping season.

The overall agricultural impact potential in segment IK is assessed as low.

RYAN (IM) - 57.0 KM

Land Use
The Ryan (IM) segment, part of a route identified to bypass Whistler and Pemberton, consists largely of rugged wilderness terrain with little existing land use impact potential. There are two areas which could be affected: the small settlement along Taillefer Creek near the south end of Birkenhead Lake at node I; and the Pemberton Valley crossing 20 km north of Pemberton with ALR land and scattered rural residential and farm dwellings.

Gingerbread and McLeod creeks are the two water supply sources within segment IM. Five licencees, including the McLeod Creek Ranch, withdraw water for irrigation purposes.

The overall land use impact potential of segment IM is assessed as low.

Agriculture
Segment IM crosses 1.25-1.5 km of high capability, deeded ALR land in the Pemberton Valley. In the general vicinity, the productive floodplain lands are cultivated, primarily for seed potato and cole crop production, as well as for beef cattle pasture and forage. If segment IM is selected, a detailed land ownership and agricultural capability/use survey should be undertaken to select an alignment that would minimize impacts on this productive land base with careful tower location. Permanent access roads should not be located within the agricultural field areas and temporary roads should be carefully reclaimed. Construction timing should try to accommodate the cropping season.

The overall agricultural impact potential in segment IM is assessed as low-moderate.

PEMBERTON (JK) - 10.0 KM

Land Use
2L1 and 2L2 are an overwhelming presence in Pemberton, both from a land use planning and visual perspective. 5L42 largely bypasses the community and while visible, it is far less intrusive than the other two lines.

The Pemberton (JK) segment route past Pemberton is adjacent to 5L42 to the south and east of the town centre. The route across the valley floor is comprised of relatively flat, privately owned farm land, mostly situated in the ALR. A proposed development of some 75-100 residential lots on DL204 (outside the village boundaries) adjacent to the Lillooet River may be affected by the route which passes through DL204 after crossing the Lillooet River. This proposal has not yet been approved and the subdivision plan was not available to evaluate the potential impact of 5L46. Figure II-2 (p.37) shows that the proposed development would be only marginally affected.

Pemberton is experiencing increased commercial demands and would benefit from the availability of additional infill development land. For example, three highway commercial developments are in the planning stage for properties (all within the Village) fronting on Portage Avenue east of the 2L1/2L2 crossing, including a 40-50 unit motel, a commercial cardlock facility and a service station. Development of these areas is compatible with the Village's Official Community Plan which encourages infill development. An additional residential proposal in the preliminary planning stages (approximately 150 dwelling units) is being contemplated for DL 165 east of the village boundaries. This property is bisected by 2L1 and 2L2 which comprise about 1.25 ha of land suitable for incorporation into the proposed development if the ROWs were released.

At the west end of this segment near node K, the route passes through the southerly edge of Nairn Falls Provincial Park. The incremental effect of 5L46 adjacent to 5L42 is expected to be minimal due to the location of the line relative to the campground area. A benefit would be the removal of the highly visible 2L1 at the entry to the Park.

Three licenced water sources are within segment JK. Jason Creek, Birkenhead River and ZZ Spring provide water for irrigation, domestic and conservation purposes.

The overall land use impact potential of segment JK is assessed as low.

Agriculture
Segment JK crosses the Pemberton Valley immediately southeast of Pemberton adjacent to 5L42. The soils of this area are dominantly highly suitable for agricultural cropping, with capabilities of Class 2 and 3, improving to Class 1 and 2 with drainage. The route transects 2 km of deeded, ALR land, approximately half of which is used for forage crops, with the remainder in pasture used for grazing.

Several of 5L42 towers are on ALR land, much of which is cultivated, drained, and irrigated cropland. The construction of 5L46 adjacent to the existing ROW, would result in some additional impacts on agricultural lands but these impacts could be minimized to acceptable levels if the alignment is selected to follow property and field boundaries and if tower sites were selected to fall between existing or potential fields; short term impacts could be reduced by avoiding construction during the growing season. Additional ROW requirements in this area would require careful alignment to avoid encroaching on residences and farm buildings. The removal of 2L1 and release of the ROW within the ALR floodplain area would provide a benefit to agriculture, as most of these lands are either being used for agriculture or could be.

The overall agricultural impact potential in segment JK is low.

GREEN (KL) - 2.0 KM

The short Green (KL) segment is located on forest lands where no land use or agricultural impacts are anticipated. There would be benefits with the removal of the highly visible 2L1 along Highway 99 near the entry to Nairn Falls Provincial Park. There are no water licences or potential agricultural impacts in segment KL.

The overall land use and agricultural impact potential of segment KL is negligible.

SOO (LM) - 18.0 KM

The Soo (LM) segment is the start of a Whistler by-pass alternative. As there is no existing settlement along segment LM, land use impacts would be minimal. There is, however, potential for development on the south-facing slopes located above the low-lying wetland areas. The upper reaches of the Soo River valley within segment LM are privately owned; one licence permits withdrawal of water from the Soo River for power generation.

The overall land use impact potential of segment LM is assessed as low and the agricultural impact potential is negligible.

WHISTLER (LN) - 37.0 KM

Land Use
Whistler is the dominant land use feature in the Whistler (LN)

segment. The route enters the municipality near Green Lake, and extends some 20 km through the municipality to where it exits into Brandywine Falls Provincial Park about 2 km north of node N. A small portion of the route northeast of Brandywine Falls exits and then re-enters the municipality (about 3.5 km).

In managing the rapid growth and development, the municipality through its Official Community Plan policies and other regulations, places a great deal of emphasis on preserving the natural environment and ensuring high standards of quality and aesthetics in the man-made features. The municipality is therefore very sensitive to the visual impact of BC Hydro's transmission lines in the community (refer to Chapter V). The three existing transmission lines (2L1, 2L2, 5L42) are a major presence in Whistler; they were constructed well before the large scale resort development. The assessment of potential impacts of 5L46 must therefore take into account the presence of these existing lines.

The north portion of segment LN generally occupies 2L1 ROW, which lies between 2L2 and 5L42, through to the bench west of Alta Lake. On the lowlands at the west end of Green Lake on both sides of Highway 99, several major golf courses and resort hotels are proposed. Notwithstanding their proximity to the transmission line corridor, the incremental impact on these developments of 5L46 situated on the 2L1 ROW would be of little appreciable consequence, because of its location between the other lines. Similarly, the municipality is undertaking the development of a new community park at the north end of Alta Lake (Rainbow Park). The parking lot for this park will likely use the existing transmission line ROW's, and whether the ROW is occupied by 2L1 or 5L46 or is left unused, makes little if any difference to the park development.

West of Nita Lake, the route departs from 2L1 with the objective of staying out of the valley floor and occupying lands which are largely undevelopable and less visible (see Figure II-3; p.37). With this rerouting, there would be minimal, if any, incremental impacts on land use and community development in the south section of Whistler; the removal of 2L1 would be of benefit, particularly west of Alpha Lake and south along Highway 99, in that it would help to reduce the present visual impact of the existing transmission lines at the south entry to Whistler.

Further south within segment LN, in the 6-7 km north of Brandywine Park, the route climbs sharply to the steep slopes bordering the Cheakamus River valley to the southeast. Land uses within this valley and adjacent to Highway 99 include Whistler's industrial area, sewage treatment plant and dump site, as well as gravel pits (Figure II-4; p.37). Use of this route would result in greater exposure of 5L42 as well as 5L46 in the view from two homes near the Cheakamus River. The benefit of removing 2L1 in this valley would be of lesser consequence, as 2L2 parallel to Highway 99 still would be a high visibility feature. However, relocation of 2L2 to follow the segment LN route would greatly reduce the visual impact in this portion of the Cheakamus River valley, and lessen aesthetic impacts on tourists using the Garibaldi Highway.

The remaining feature in segment LN is Brandywine Falls Provincial Park. Removal of 2L1, which is a highly visible feature at the entry to the park, would enhance the attractiveness and appeal of the park. The route at the easterly edge of the park would have a lower impact on park users.

Twelve licenced water supply sources are within segment LN. Several of the licences held on these sources allow the withdrawal of substantial volumes of water. These include Whistler's licences on Rideau Brook and Alta Creek (in excess of 1.14 million l/day), Whistler Mountain Ski Corporation's licence on Fitzsimmons Creek (34.1 million l/day), Blackcomb Ski Enterprises Ltd.'s licence on Fitzsimmons Creek (.09 cubic m/second) and Alpha Creek waterwork's licence on Alpha Creek (1.34 million l/day). In total, sixteen water licences are held for a variety of uses.

The overall land use impact potential of segment LN is assessed as low; and the agricultural impact potential is negligible.

RAINBOW (MN) - 23.0 KM

As previously noted, the Rainbow (MN) segment is part of the Whistler bypass route, in combination with the either of the Soo (LM) or Ryan (IM) segments. Relevant considerations in segment MN include:

- the Callaghan Creek forest road north of McGuire provides access to existing and potential outdoor recreation areas which are being subjected to increasing levels of use;
- the route enters Whistler about 9 km north of node N and exits about 3.5 km north of node N. While this area is not presently developed, much of it may serve as a future development area in the long term growth of Whistler. While no commitments have been made to this effect, 5L46 on segment MN would detract from the potential of this area.
- In July 1990 the Ministry of Crown Lands requested proposals for the development of Callaghan Valley. Segment MN traverses 2 km of the eastern fringe of land identified as being suitable for nordic skiing/residential and traverses for 7.5 km land identified as being suitable for golf/residential; 5L46 would create a major visual impact and planing constraint.
- the Ministry of Crown Lands issues permits in the Rainbow and Callaghan mountain areas to several Whistler-based heli-skiing operations. The Ministry opposes segment MN due to a concern for the safety of the helicopters, particularly in Rainbow Pass, and during poor weather conditions when visibility is limited.
- since its incorporation, Whistler has been focusing on the management of development within the presently settled area; they have not fully considered long term planning for development and recreation in the western part of the municipality or adjacent mountainous areas. Use of segment MN prior to the completion of the planning process may compromise the long term quality of recreation opportunities.

The B.C. Ministry of Parks has a licence to withdraw 4,550 l/day of water from Brandywine Creek for domestic use. This is the only licenced water source within segment MN.

The overall land use impact potential of segment MN is assessed as high; agricultural impact potential is negligible.

UPPER CHEAKAMUS (NP) - 13.7 KM

Land Use

The Upper Cheakamus (NP) segment would utilize the 2L1 ROW for the first 9 km south of node N. Although there are several clusters of recreational residential development in this area (eg. Pinecrest Estates), and 2L1 is highly visible from Highway 99, there would be no appreciable incremental impacts in replacing 2L1 with 5L46.

The route then leaves the valley to a bench on the west side of the valley. Butterfly Lake, which has a number of recreational lots, is within .5 km of the route near node P. Access to Butterfly Lake is difficult and is gained from the Squamish Valley to the west. 5L46 would have no direct impact on the Butterfly Lake lots, as it would not be visible except from a distance crossing the ridge at the head of Cheakamus Canyon.

There are nine water licences from seven sources in segment NP: Evelyn Brook, Ransom Creek, Pinecrest Lake, Cheakamus River, and Freeman, Crane and Chance creeks.

The overall land use impact potential of segment NP is assessed as low; and agricultural impact potential is negligible.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

Land Use

Most of the Lower Cheakamus (PQRT) segment is in the valley bottom, much of it relatively flat with development potential. From about 2.5 km south of node P, the route is within the District Municipality of Squamish. Squamish's Official Community Plan anticipates continuation of existing development patterns in this area. There is scattered rural residential development from node Q south about 5 km with access via BC Hydro's 2L1 service road. There is a cluster of 25-30 rural dwellings on DLs 1246, 1247, 1248 and 1249 (north of node R). Tenderfoot Creek Salmonid Enhancement Facility is located on DL 1246 east of node R.

North Vancouver Outdoor School and Conference Centre is situated adjacent to 2L1 on DL 1244 about 1.5 km south of node

R. The school uses the 2L1 ROW for playfields and parking lots. The existing line traverses the eastern edge of Cheakamus IR 11 and there are several residences on this portion of the reserve. Constraints to development in this area include 2L1 as well as potential flooding of the Cheakamus River. The 2L1 ROW crosses a number of existing but undeveloped lots in DL 1817 and DL 4351 at the confluence of the Cheekye and Cheakamus rivers; flood hazards limit the development potential of this area. The Cheekye equestrian stables, adjacent to 2L1 near the substation, use the ROW for riding and corrals.

If this route were not used for 5L46, there would be some benefits realized by local property owners through dismantling of 2L1 and release of the ROW (however, it should be noted that 2L1 may not be dismantled as discussed in the INTRODUCTION):

- aesthetic improvements and the elimination of concerns regarding health effects of EMF;
- enhancement of the potential for additional rural residential development; it would also facilitate the use and expansion of facilities such as the Outdoor School and Conference Centre. It should be noted however, that the District of Squamish through its Official Community Plan does not envisage the Cheakamus Valley as a future growth area;
- by relocating away from Cheakamus IR 11, potential difficulties to BC Hydro in locating 5L46 on Indian Reserve land would be eliminated. It would also enhance the development potential of this portion of the Reserve;
- BC Hydro's service road may become a designated access road, allowing subdivision of property; and
- values of properties in the valley bottom likely would be enhanced.

There are other concerns with respect to release of the 2L1 ROW in this area. From BC Hydro's perspective, a well established, easily maintained ROW well suited to 5L46 would be lost. In addition, the pattern of land use in the area has evolved with the presence of 2L1 in such a way that physical restrictions on land use are minimized. Given this situation, and the fact that the Cheakamus Valley is not foreseen as a future growth area, the continuing impact of a transmission line on the existing 2L1 ROW would not be significant.

There are six water licences, all on Swift Creek in segment PQRT.

The overall land use impact potential of segment PQRT is assessed as low.

Agriculture
Segment PQRT traverses the westerly edge of a 4.5 km long parcel of low-moderate capability, deeded ALR land on the lower floodplain of the Cheakamus River. Agricultural production is very limited in this area with most of the cultivation being in forage production associated with the North Vancouver Outdoor School and small hobby farms. Most of the agriculture occurs on gently sloping alluvial fans and morainal deposits at the base of the valley wall, where drainage is better than for most of the floodplain soils.

Overall agricultural impact potential in segment PQRT is assessed as low as all of the existing fields could be avoided with careful access road location and tower placement; removal of 2L1, would make additional agricultural land available.

West (PR) Suboption - 10.0 KM
The west (PR) suboption is located on the upper bench west of the valley. There is limited existing use (DL 1817 and 1818) and limited development potential, and all of the route, except near node R as it returns to the valley floor, is unalienated Crown land. As suboption PR returns to the valley floor, it enters the Squamish boundaries (about 1.25 km northwest of node R). There are no licenced water sources in suboption PR.

The land use impact potential of suboption PR is assessed as low; agricultural impact potential is negligible.

East (QS) Suboption - 10.0 KM
Due to rough terrain conditions, there is virtually no development potential in the east (QS) suboption so that land use impacts would be minimal. It is noted, however, that significant portions of the route are comprised of privately owned land. It would appear that most of the District Lots (eg. DL 1246, 1247, 1248, 1249, 1250, 1251 and 3033) are extensions eastward from the valley bottom. From 2.5 km south of node Q, suboption QS also lies within the District of Squamish. Swift Creek is the only licenced water source in suboption QS.

The land use impact potential of suboption QS is assessed as low; agricultural impact potential is negligible.

South (RST) Suboption - 6.1 KM
The only significant land use features in the south (RST) suboption are the road crossing at node R and the nearby Tenderfoot Creek fish rearing facility. The land use impact potential of this valley crossing would therefore be minimal. The land east of the Cheakamus River is very rugged and has no development potential except for portions of DLs 1817 and 1818, which are located on the fan of the Cheekye River which presents a severe flood hazard.

Water licences exist on Eli Spring and the Cheekye River in suboption RST.

The land use impact potential of suboption RST is assessed as low; agricultural impact potential is negligible-low.

1990 ALTERNATIVES

ORE (UV) SEGMENT - 38.0 KM

Land Use
The Ore (UV) segment commences on a broad bench west of the Fraser River, ascends to the Camelsfoot Range and remains at a high elevation (approximately 1900 m) before descending into the Yalakom River valley. The route then climbs out of this valley, turns southeast and parallels the Yalakom and Bridge rivers to node V. Notable land use/status features include: a concentration of alienated land in the Yalakom River valley in the vicinity of the rural settlement of Moha which is used by the residents of Moha for residential, farming and other uses; and Bridge River IR 1, adjacent to the terminus of the route at node V.

As much of segment UV traverses steep, remote areas within the Camelsfoot Range, few potential land use impacts are anticipated; however, the portion of segment UV which crosses and runs parallel to the Yalakom River valley is opposed by residents of the Moha area, who perceive that it compromises the environmental integrity of their settlement.

Five licenced water sources are traversed by segment UV. The most significant of these are the Yalakom River, which provides domestic, storage and irrigation supplies to two licencees, and Buck Creek, which supplies four licencees.

The overall land use impact potential of segment UV is moderate.

Agriculture
Segment UV passes through the Lower and Upper Swamp grazing sub-units for 13 km west of node U. These are forested rangelands used for grazing and would not be adversely affected; ROW clearing and range improvements would provide a net benefit for grazing. On the west bank of the Yalakom River, segment UV is close to some minor irrigated hay lands and occasional horticulture use; none of this activity is in the ALR.

The agricultural impact potential is judged to be negligible-low.

BRIDGE (F1X) - 19.7 KM

Land Use
The Bridge (F1X) segment commences on a slope which rises above range lands located on a plateau west of the Fraser River. The route then climbs sharply and remains at a high elevation until its terminus at node X. There are few significant land use/status features along segment F1X, with the exception of: D L 8445 (alienated Crown Land) located near Applespring Creek; and farming activities in the vicinity of node X, associated with the rural settlement in the Moha area.

Segment F1X crosses Antoine Creek, a licenced water source, east of node X. Six licencees withdraw water from Antoine Creek for domestic, irrigation and power generation uses. Two other licenced water sources are also traversed by segment F1X.

Land use impact potential is low along segment F1X; opposition to this route option by Moha residents has been established.

Agriculture
The initial 4 km of segment F1X pass through the Black Hill and Dickie Mountain subunits of the Gammon grazing lease. No adverse agricultural impacts would occur on these rugged forested grazing areas, and range improvements from ROW clearing would provide a net benefit to grazing. There are no other agricultural land use issues in the remainder of segment F1X.

The overall agricultural impact potential is judged to be negligible-low.

EAST PAVILION (WW1DE) - 11.8 KM

Land Use
The East Pavilion (WW1DE) segment commences on a broad bench north of the Pavilion IR and crosses the Pavilion Creek valley to a plateau east of the Fraser River. Turning west, the route descends from this plateau, crosses a utility corridor and the Fraser and then climbs sharply to its western terminus (node E), located upslope of a bench overlooking the Fraser. Given the significant variations in topography along segment WW1DE, land uses are limited to extensive ranching/agricultural uses. Notable land use/ status features include:

- extensive areas of alienated Crown Land along much of the route, with the exception of those lands between nodes W1 and D;
- ranch lands in the Pavilion Creek valley and on either side of the Fraser between nodes D and E; and
- a well established utility corridor west of node D, comprising Highway 12, the BC Rail line and three BC Hydro transmission lines.

Pavilion Creek is the only licenced water source which intersects segment WW1DE. The Diamond S Ranch holds several licences on Pavilion Creek and withdraws water for irrigation use.

Land use impact potential associated with segment WW1DE is assessed as low due to the extensive nature of existing land uses; a possible area of impact is located west of node D, where irrigation works are in place.

Agriculture
The section of segment WW1DE between nodes D and E is identical to the DE section of the Fraser (CDE) suboption (p.29), which traverses agricultural land on both sides of the Fraser Canyon and is judged to have moderate agricultural impact potential. Between nodes W and W1, the route passes over pasture and grazing lands beginning approximately 2 km south of node W, followed by mixed forest and open rangelands; impact potential is low-moderate on this section of segment WW1DE.

The overall agricultural impact potential of segment WW1DE is judged to be moderate.

SOUTH PAVILION (W1F1) - 8.5 KM

Land Use
The South Pavilion (W1F1) segment traverses southwest along sloping terrain before descending to a wide bench east of the Fraser River. After crossing the Fraser, the route climbs steeply to node F1. Alienated land along this route is located in the vicinity of node W1, and on a wide bench east of the Fraser. Land use includes the utility corridor running roughly parallel to and east of the Fraser, and the large ranch located on the wide bench east of the Fraser; neither of these land uses would be substantially impacted if segment W1F1 was chosen. There are no licenced water sources along segment W1F1.

The overall land use impact potential in segment W1F1 is assessed as low.

Agriculture
Segment W1F1 traverses approximately 2 km of ALR land immediately south of node W1 and another 2 km of ALR containing irrigated haylands immediately east of the Fraser crossing.

The agricultural impact potential of segment W1F1 is similar to that of the other Pavilion routes in terms of disruption to irrigated hay production on the east bank of the Fraser, and is rated low-moderate.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton (G1G2) suboption deflects from the Anderson (GH) segment north of the Slosh IR 1 and remains north of Indian Reserve lands in the Seton Portage area prior to rejoining segment GH southwest of Seton Lake IR 5A. Suboption G1G2 traverses extremely steep slopes above the settled areas in Seton Portage, and therefore would have no land use impacts. Whitecap Creek is the only licenced water source which intersects the route; it supplies irrigation water to two licencees.

The overall land use and agricultural impact potential is negligible on the steep slopes of suboption G1G2.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

Land Use
The D'Arcy (H1H2) suboption also diverges from the Anderson (GH) segment joining the Gates (HJ) segment between the settlements of D'Arcy and Gates Lake. The suboption crosses Anderson Lake, climbs to the steep slopes east of D'Arcy and remains on these steep, west-facing slopes to the point at which it joins segment HJ. There are some very significant land use/ status features with respect to suboption H1H2, including:

- the crossing over Anderson Lake is in full view of the settlement of D'Arcy;
- the point at which the route crosses the shoreline after the Anderson Lake crossing is alienated land used for rural residential and recreation; the crossing would be in the full forward view of residents; and
- additional alienated land is located in close proximity to suboption H1H2 along the remainder of its length; DL 3081, an alienated parcel, is traversed by the route.

Suboption H1H2 would have detrimental impacts on the settlement/recreation area on Anderson Lake at the eastern point of the lake crossing. However, the location of the remainder of the route above the valley floor in the Devine/Gates Valley is supportive of policies contained in the Regional Plan: valuable land on the valley floor is not utilized; areas designated for residential development are not compromised; and lands traversed by suboption H1H2 have little or no development potential.

Six licenced water sources intersect suboption H1H2. Twelve licencees withdraw water from these sources for domestic, irrigation, power generation and waterworks (Devine Water Specified Area) uses.

The overall land use impact potential of suboption H1H2 is high.

Agriculture
Suboption H1H2 passes south of any agricultural activity in the Gates Valley; consequently agricultural impact potential is negligible.

LOKLA SUBOPTION - 1.0 KM

The Lokla suboption is located in the narrow Birkenhead River valley. Notable land use/status aspects include: traversing alienated Crown Land (DL 957); Lokla IR 4 is adjacent to the route; and several utilities are located in this valley, including the Pemberton-D'Arcy road, the BC Rail line and BC Hydro transmission lines (2L1/ 2L2,3L2, and 5L42). The Mount Currie Band may have concerns which have not been detailed. The Band council did identify the proliferation of utility demands (i.e. road, rail and electricity) as a concern which must be addressed by government.

No licenced water supplies intersect the Lokla suboption.

No negative land use impact potential is associated with the Lokla suboption; agricultural impact potential is negligible.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

The Function (Y1Y) suboption begins on the slope above Whistler's industrial area and then turns south across the Cheakamus River, climbing from the river valley to node Y. Major land use/tenure features of the industrial area include:

- all land in the industrial area is alienated; the route uses an established ROW along the north margin of the area.
- the main road through the industrial area runs parallel to the suboption route. Parcels on the north side of this road (adjacent to route) are fully developed with light industrial uses. Infill potential exists on the south side of this road, away from the suboption route;
- the suboption route crosses a utility corridor (Hwy. 99, BC Rail line, 2L1/2L2, and 5L42) west of Whistler's sewage treatment plant and sanitary landfill facilities;
- the route achieves a crossing of the valley floor over gravel pits and landfills where there is no land use conflict;
- the route avoids impacting the view from two homes adjacent to the Cheakamus River; and
- the route does not interfere with land use in the vicinity of the Whistler Museum and sewage plant.

Vanwest Brook is the only licenced water source which intersects suboption Y1Y; this source supplies water to two licencees for industrial and waterworks (Vanwest Water Utility Corp.) uses.

No potential conflicts are anticipated considering land uses in this area (light industrial, utility/transmission corridor) and the Function suboption alignment on steep slopes above an industrial area in which the greatest infill potential exists away from the route.

The overall land use and agricultural impact potential of suboption Y1Y is judged to be negligible.

CALLAGHAN (N1Y2) - 6.7 KM

The Callaghan (N1Y2) segment commences in the middle of the Callaghan Valley, south of Alexander Falls. After crossing to the eastern side of the valley, the route traverses the toe of southwest facing slopes bordering the Callaghan Valley and enters the Cheakamus Valley. Within the Cheakamus Valley segment N1Y2 crosses a transmission/utility corridor comprising BC Hydro transmission lines, the Garibaldi Highway and the BC Rail line. The route then climbs out of the Cheakamus Valley and turns southward to its terminus at node Y2. Land status and use features associated with segment N1Y2 include:

- much of the route lies within Whistler's boundaries;
- DL 3559 is undeveloped alienated land. All other land traversed by segment N1Y2 is Crown Land;
- the initial portion of segment N1Y2 (node N1 to the eastern side of the Callaghan Valley) traverses land identified in the Ministry of Crown Lands' proposal call for development of the Callaghan Valley which anticipates golf course and associated residential uses taking place in this area. Use of the initial portion of segment N1Y2 may compromise the ability to develop the valley bottom lands for these uses; and
- potential visual impacts associated with the crossing of the toe of the slope on the eastern side of the Callaghan Valley are expected to be reduced due to the screening effect of regenerating forest vegetation.

In summary, the most substantive potential land use impacts within segment N1Y2 are in the vicinity of node N1, where future residential and recreation uses may be compromised.

The overall land use impact potential in segment N1Y2 is assessed as moderate; the agricultural impact potential is negligible.

HIGH CHEAKAMUS (YZT) - 36.6 KM

Land Use

The High Cheakamus (YZT) segment begins on the steep slopes to the east of the Cheakamus River valley and remains above this valley until the point at which it turns westward, east of node Z. The final portion of segment YZT descends into the valley en route to its terminus at node T. There are few significant land status/use features along segment YZT until it reaches Squamish, with the exception of alienated Crown land in the Garibaldi area. The route enters Squamish at its northern boundary and crosses considerable alienated Crown land in the northern portion of the municipality; it then leaves the municipality and traverses along its eastern boundary before turning westward (near Cat Lake). There are several notable aspects of the final portion of segment YZT (nodes Z to T), including:

- the route avoids all alienated land until it turns west to Cheekye;
- the route crosses a hazard area at Rubble Creek and comes close to isolated residences in DL 2605 and DL 424 (Swift Creek);
- two rural residences in DL 1818 are close to the route;
- a vacant residential subdivision in DL 1817 on the eastern bank of the Cheekye River; development may not occur because of flood risk; and
- Cheekye Stables are within and adjacent to the route immediately north and east of the Cheekye substation.

Some land use impacts may be anticipated along the final portion of the segment YZT with the presence of existing and potential residential and recreational uses; given the scattered nature of these uses and flood hazard at the vacant subdivision, the impact potential is assessed as low.

There are six licenced water sources along segment YZT, supplying seven licencees with water for domestic, irrigation, storage and power generation uses. The most significant of these sources is Swift Creek, which supports six licences.

The overall land use impact potential in segment YZT is assessed as low.

Agriculture

The High Cheakamus (YZT) segment avoids all ALR lands in the Cheakamus Valley, consequently agricultural impact potential is negligible in segment YZT.

PINECREST (Y1N2P1) - 21.6 KM

The Pinecrest (Y1N2P1) segment begins by paralleling existing transmission lines (2L1/2L2) along the north edge of Whistler's industrial area. The route is located on steep slopes which possess no further development potential for industrial use. Given this fact, and the industrial context of the area, no impacts are anticipated.

The route crosses the entrance to the Callaghan Valley, through the proposed recreational and residential and development area. Golf and residential uses are shown at the valley entrance on the proposed concept plan. As the route is located in an existing transmission/utility corridor, few impacts are anticipated; any such impacts would be incremental in nature.

The portion of the route from the Callaghan Valley to the crossing of the Cheakamus Valley has no potential land use impacts associated with it, for two reasons: it is remote from any existing development (i.e. recreation/residential lots at Pinecrest Lake); and, it traverses terrain with no development potential given its lack of access and degree of topographic variation.

In the Garibaldi area, the route runs parallel to and west of 5L42 from the south end of Daisy Lake to a point just before node P1 (the junction of Pinecrest and High Cheakamus segments). After it crosses the Cheakamus River, the route is close to the remnant settlement at Garibaldi.

Licenced water sources traversed by segment Y1N2P1 include Van West Brook, Rubble Creek and the Cheakamus River.

The overall land use impact potential in segment Y1N2P1 and its suboption (Y1YN2) is low; the agricultural impact potential is negligible.

Figure II-1 SHALALTH/SETON PORTAGE DEVELOPMENT POTENTIAL

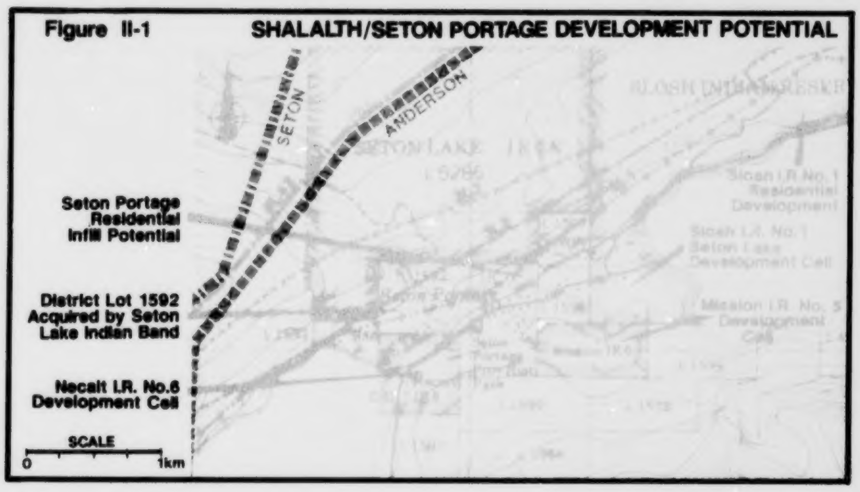

Seton Portage Residential Infill Potential
District Lot 1592 Acquired by Seton Lake Indian Band
Necait I.R. No.6 Development Cell
SCALE
0
1km
SETON
ANDERSON
SETON LAKE
Slosh I.R. No. 1 Residential Development
Slosh I.R. No. 1 Seton Lake Development Cell
Mission I.R. No. 5 Development Cell

Figure II-2 PEMBERTON AREA PROPOSED DEVELOPMENT

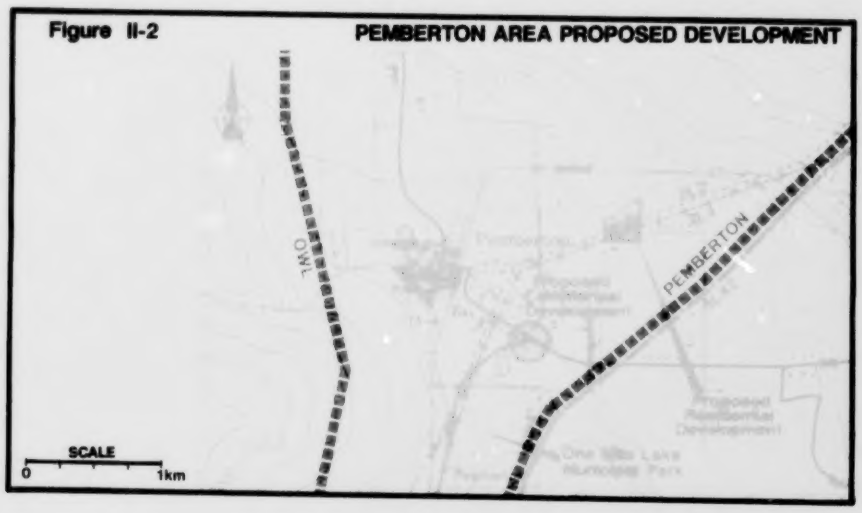

SCALE
0
1km
OWL
PEMBERTON
Proposed Commercial Development
Proposed Residential Development
One Mile Lake Municipal Park

Figure II-3 ROUTING IN THE ALPHA/NITA LAKES AREA

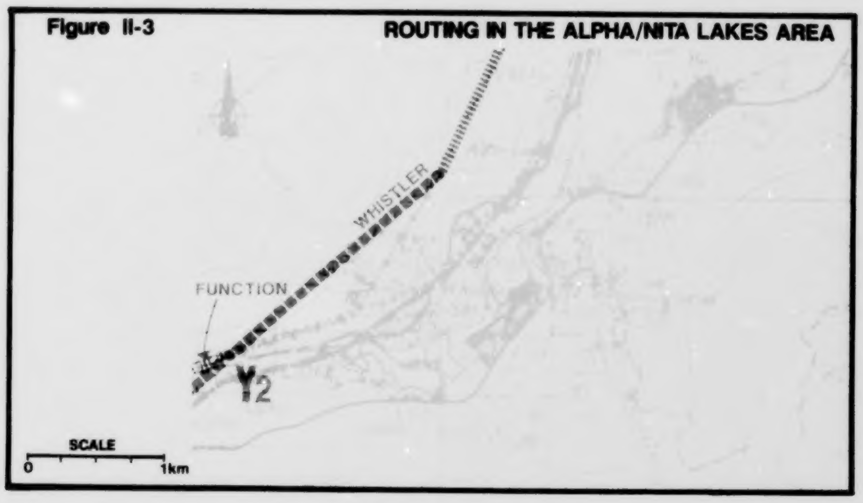
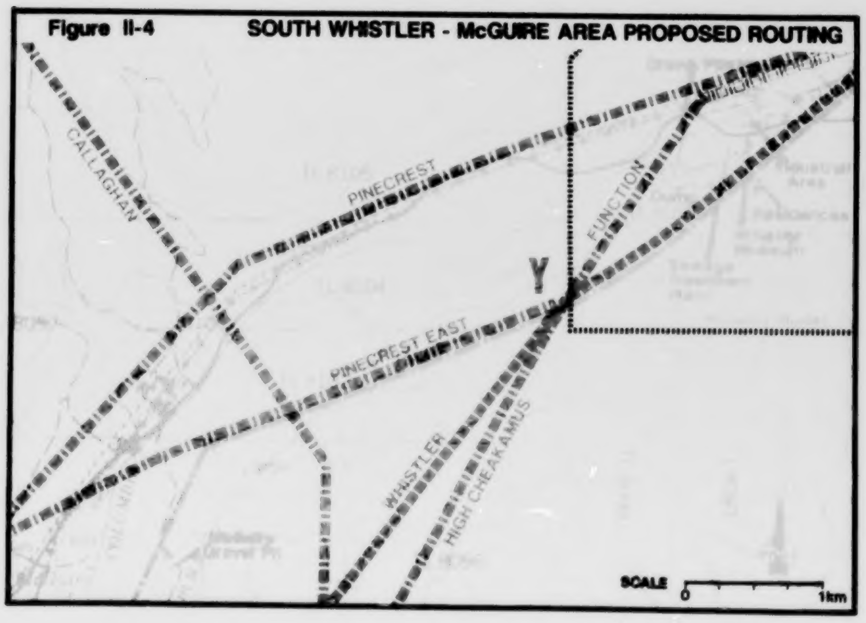


Figure II-4 SOUTH WHISTLER - McGUIRE AREA PROPOSED ROUTING



For Legend refer to Map Series II.

MAP SERIES II

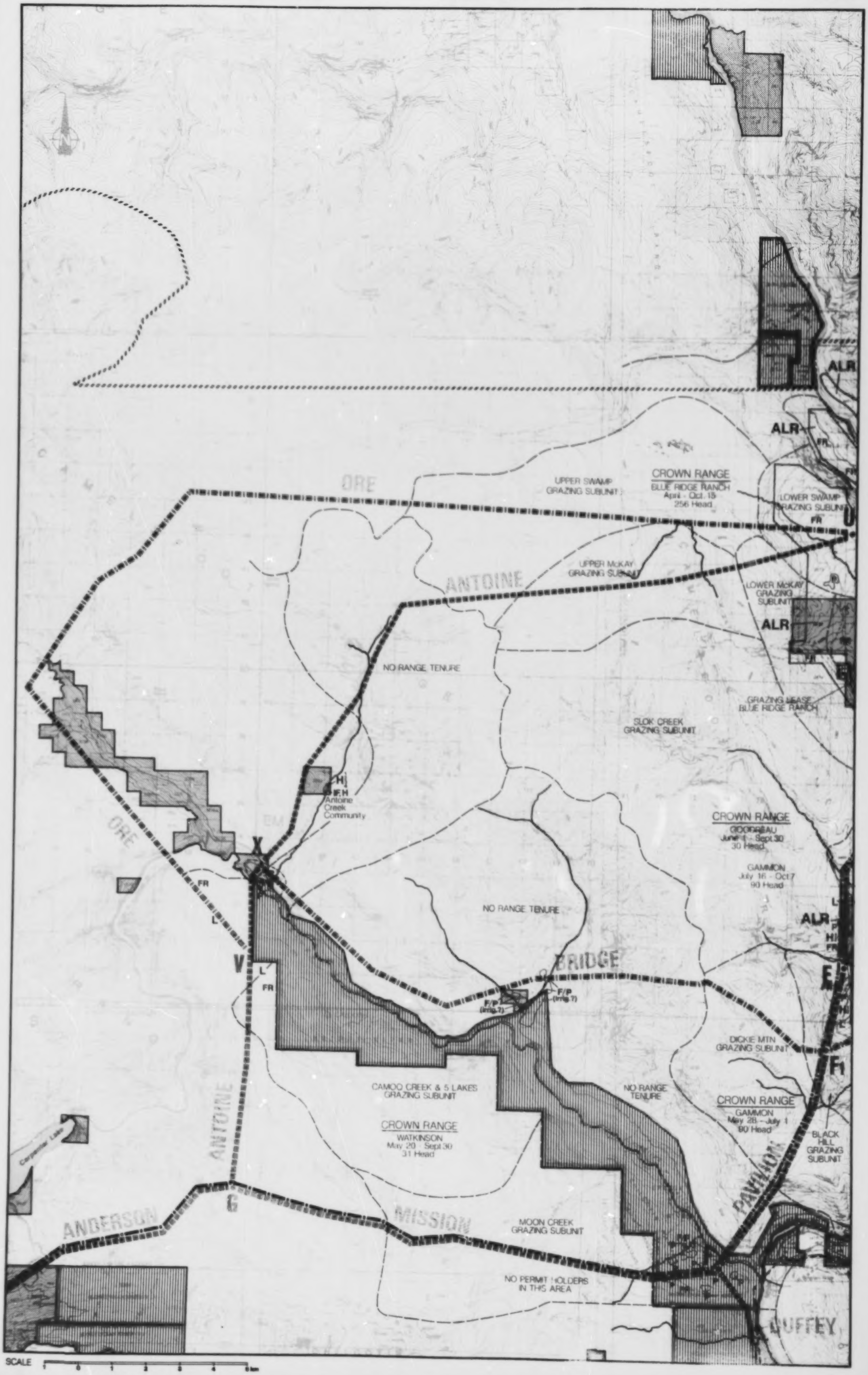
Land Use and Agriculture

Camelsfoot	**1 West**
Fraser River	**1 East**
Bridge River	**2**
Cayoosh	**3**
Anderson	**4 North**
Duffey	**4 South**
Gates River	**5**
Pemberton Valley	**6**
Whistler	**7**
Cheakamus	**8**

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CAMELSFOOT

LAND USE AND AGRICULTURE II - 1 West



LAND USE AND AGRICULTURE
Map Series II

LEGEND

TRANSMISSION SYSTEM

EXISTING

·◆··◆··◆ 2L1 RoW - not utilized for 5L46
------ 2L2
– – – – 2L90 and 2L91
-·-·-·- 3L2
·········· 5L41
▬·▬·▬ 5L42

5L46 ROUTE ALTERNATIVES

·········· 1989 NETWORK - Utilizing 2L1 RoW
▪▪▪▪▪ 1989 NETWORK - Utilizing New RoW
▪ ▪ ▪ 1989 NETWORK - Utilizing Existing Unoccupied RoW
–––– 1990 ALTERNATIVES - Utilizing 2L1 RoW
▬·▬·▬ 1990 ALTERNATIVES - Utilizing New RoW
•A NETWORK NODE

LAND USE

☐ Crown Land
▩ Alienated Land
⁄⁄⁄⁄⁄⁄ Regional District Boundary
·········· Municipal Boundary
▥ Indian Reserve
▬·▬·▬ Land District Boundary
——— Waterworks District Boundary
〰 ✪ Water Source Licenced for Water Supply

Callaghan Valley Proposal

▩ Golf/Residential
▨ Alpine Skiing
▨ Nordic Skiing/Residential
–·–·– Government Land Reserve

AGRICULTURE

——— Agricultural Land Reserve Boundary
– – – Crown Range and Grazing Subunit Boundaries
——— Land Use Boundary
- - - - Impact Rating Boundary

LAND USE

H	Horticulture
IF	Irrigated Forage
F	Non - Irrigated Forage
P	Improved Pasture
OR	Open Range
FR	Forested Range
N	Non - Agricultural Use

$M\begin{smallmatrix}1\\2\\3\end{smallmatrix}$

Impact Rating*

H	Land Capability Classes 1 and 2
M	Land Capability Classes 3 and 4
L	Land Capability Classes 5 and 6

Impact Type

1	Crop Loss
2	Loss of Arable Land
3	Soil Compaction
4	Disruption of Irrigation
5	Disruption of Drainage

*Based on British Columbia Land Inventory Ratings

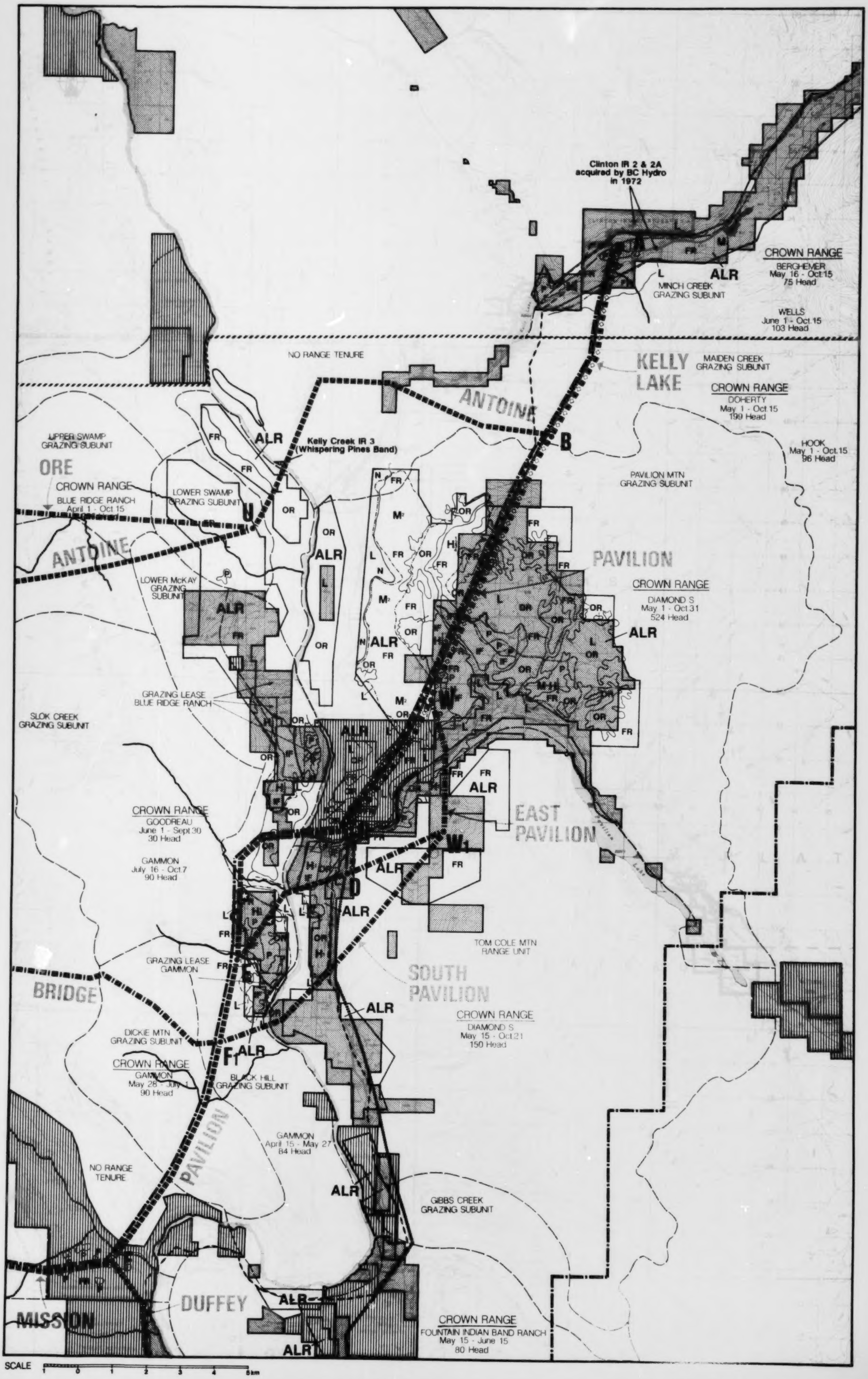
MAP SERIES II
LEGEND
(Foldout) →

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

FRASER RIVER

LAND USE AND AGRICULTURE

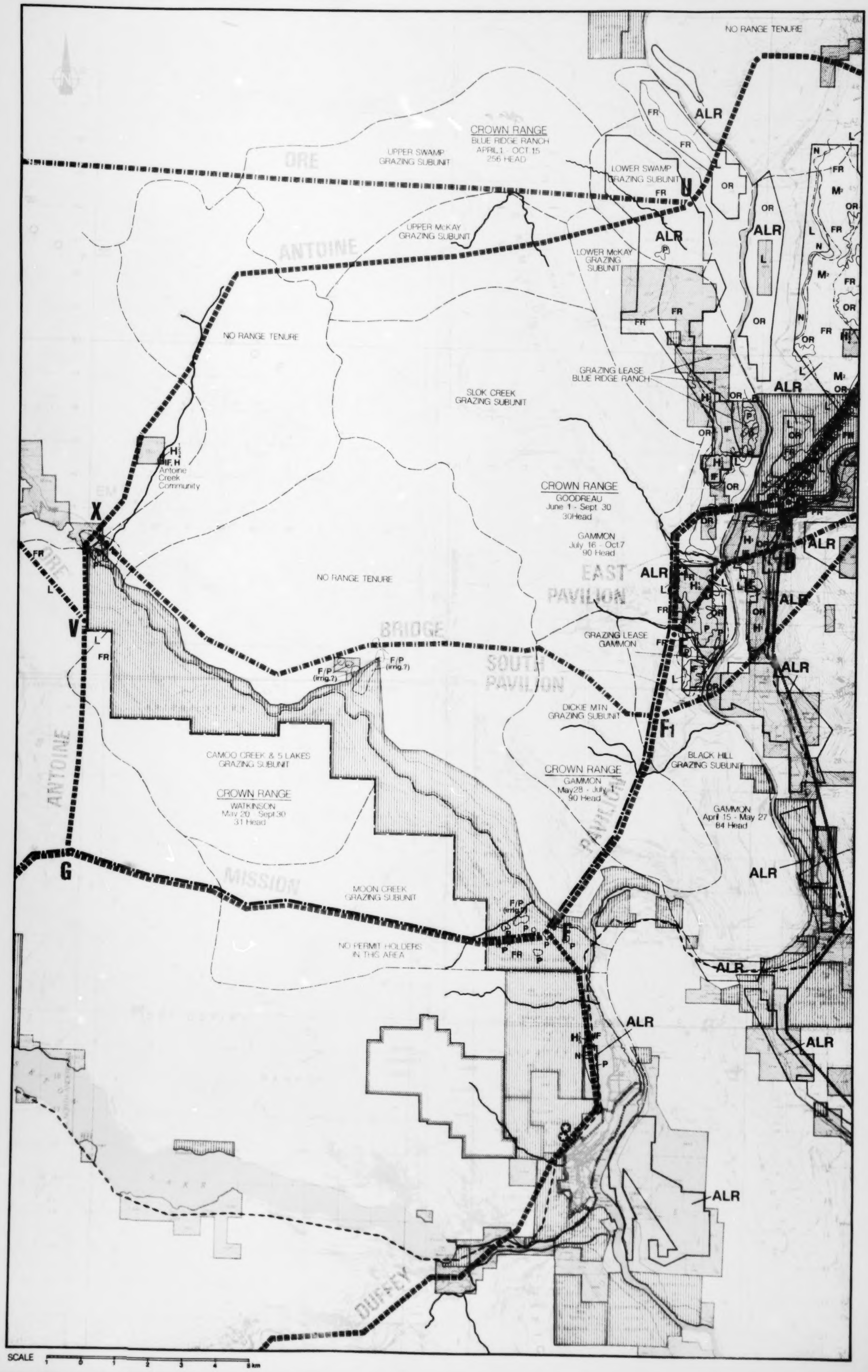
II-1 East



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

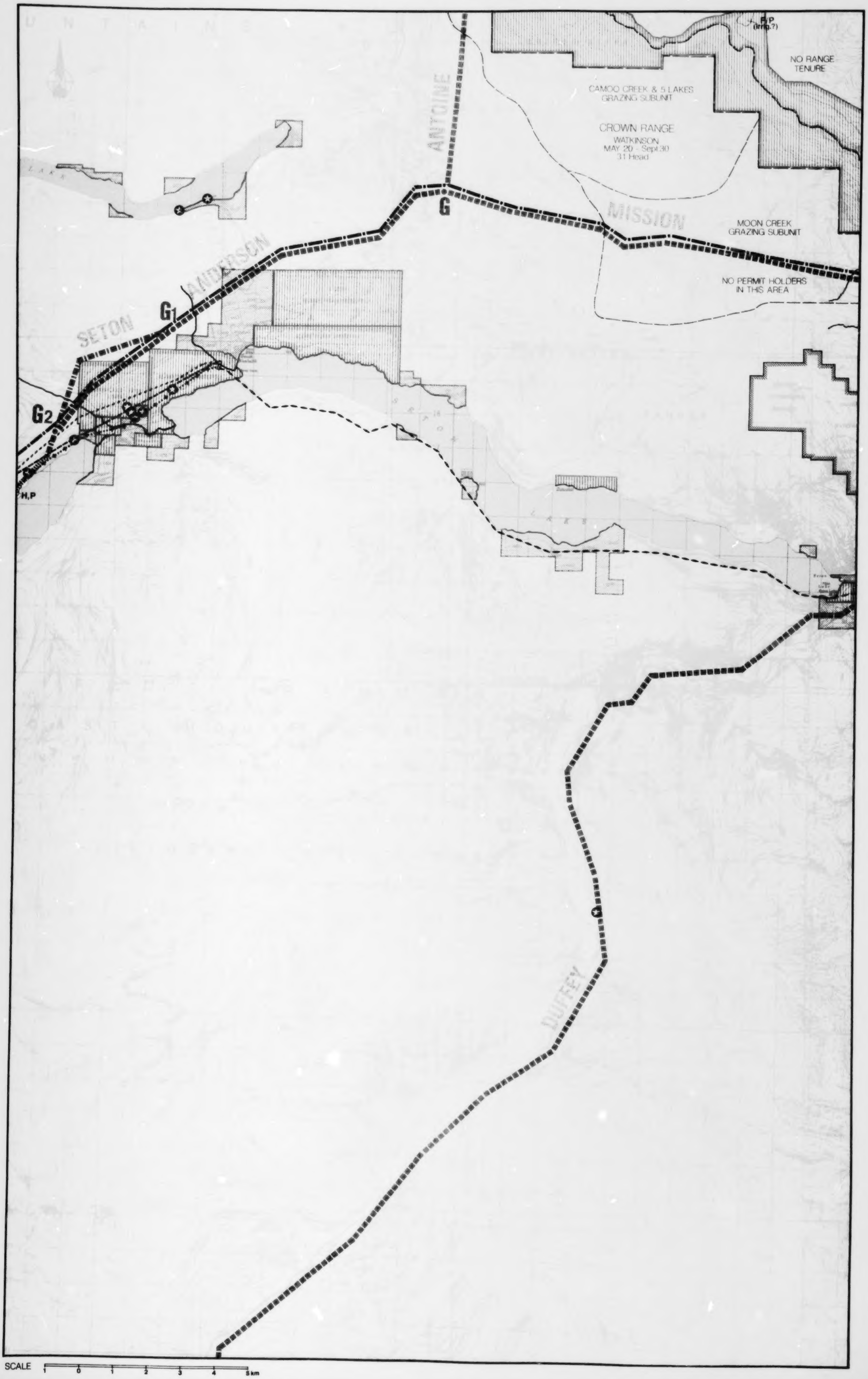
BRIDGE RIVER

LAND USE AND AGRICULTURE II - 2



CAYOOSH

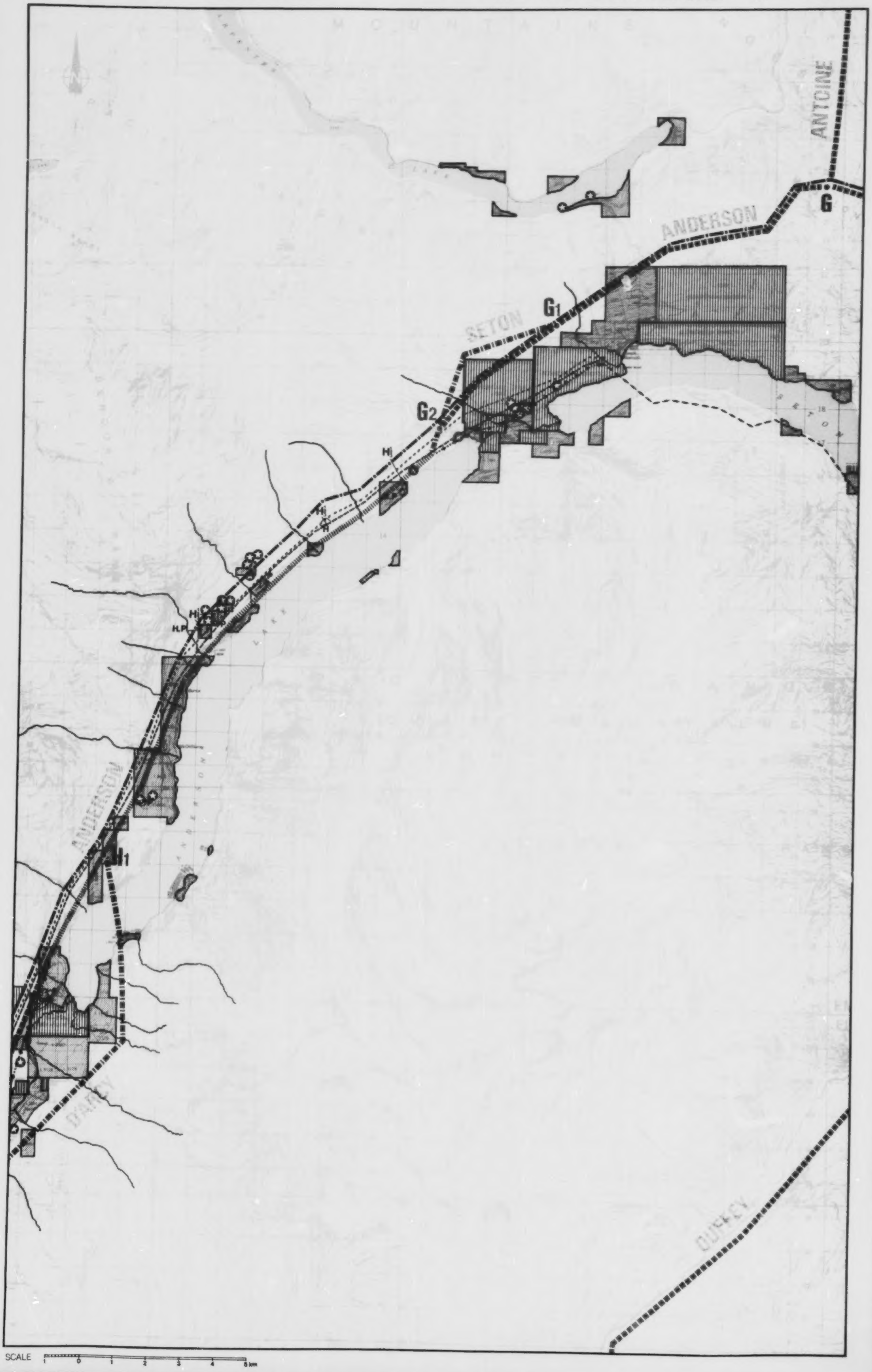
LAND USE AND AGRICULTURE II - 3



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

ANDERSON

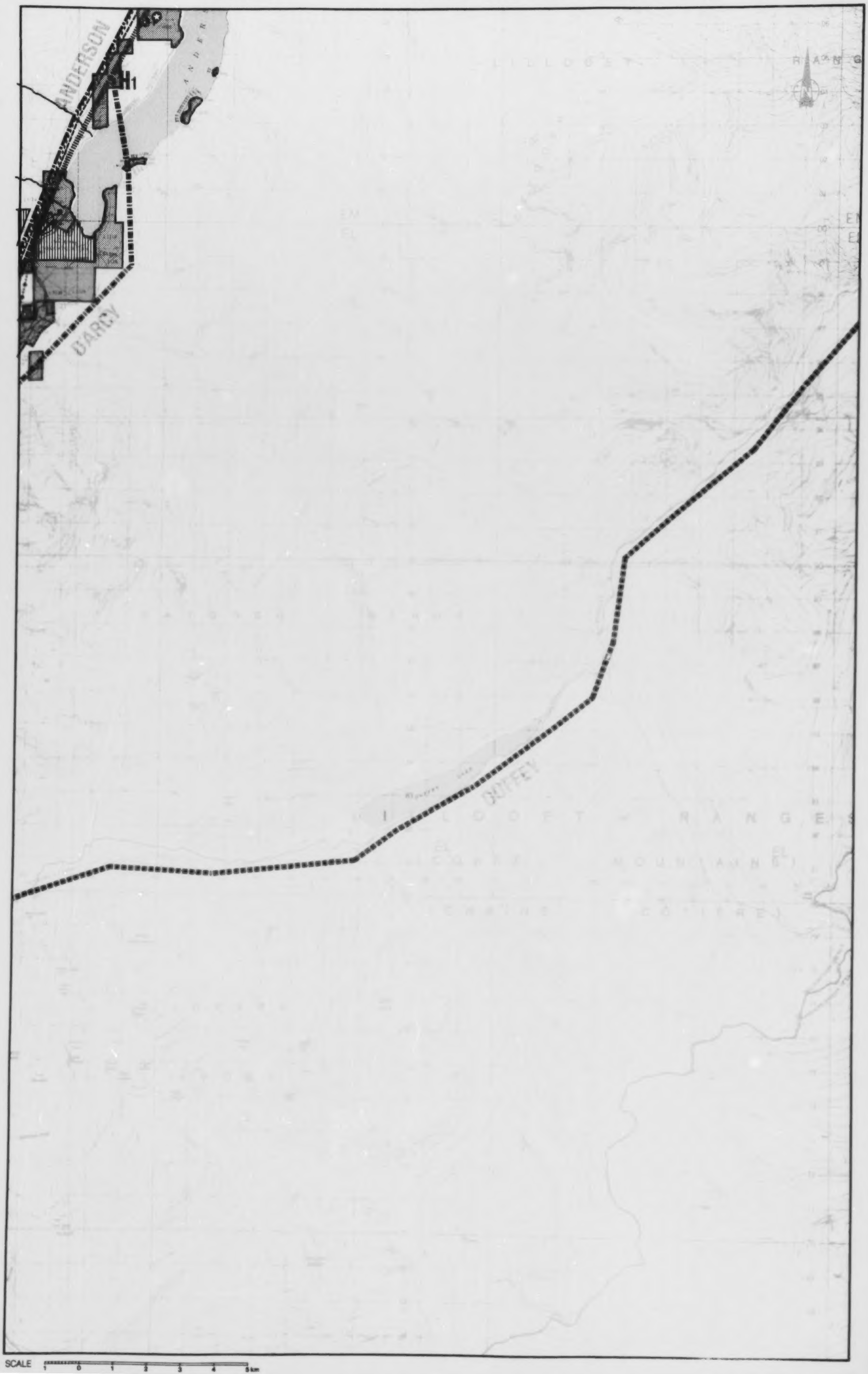
LAND USE AND AGRICULTURE II - 4 North



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

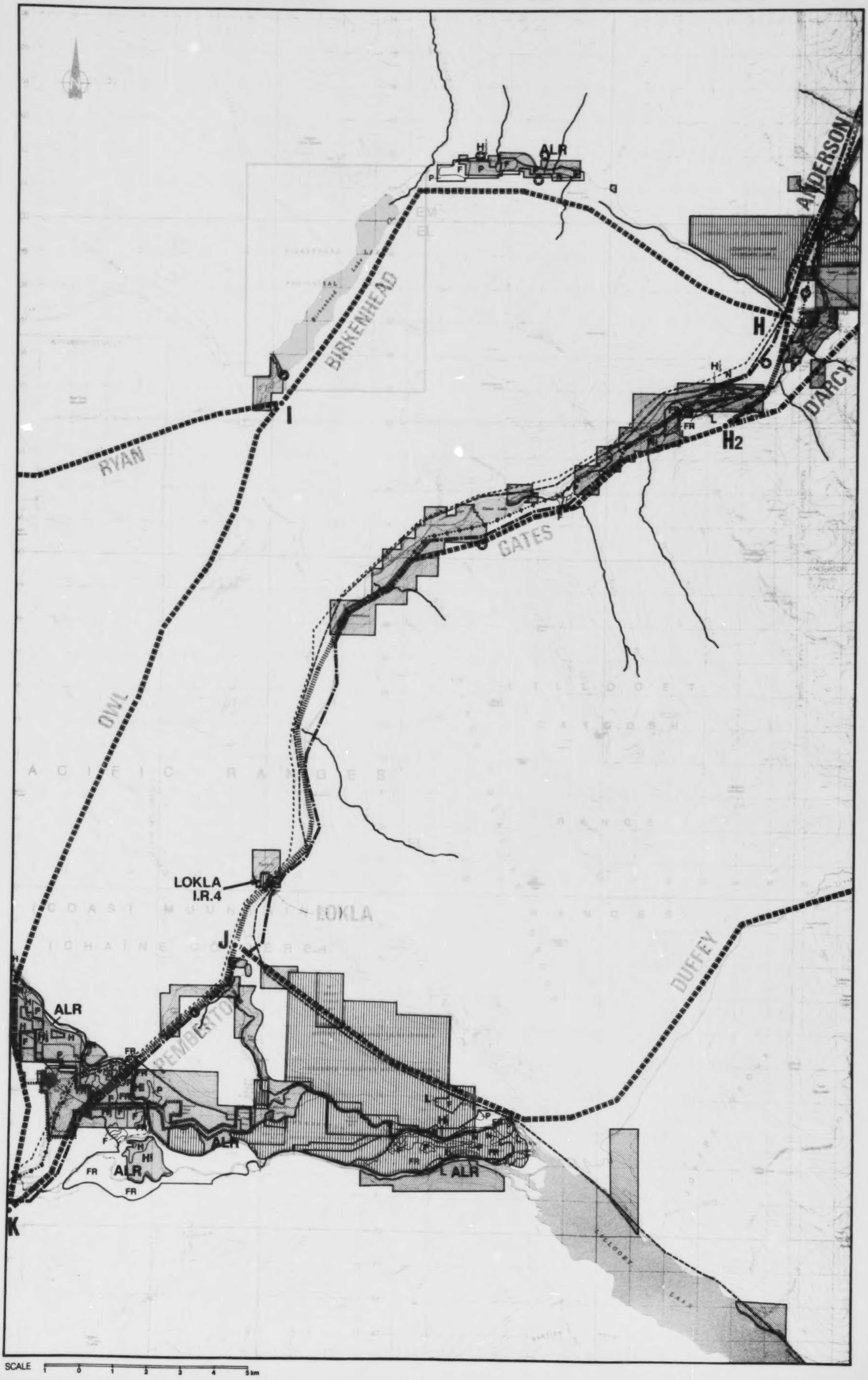
DUFFEY

LAND USE AND AGRICULTURE II - 4 South



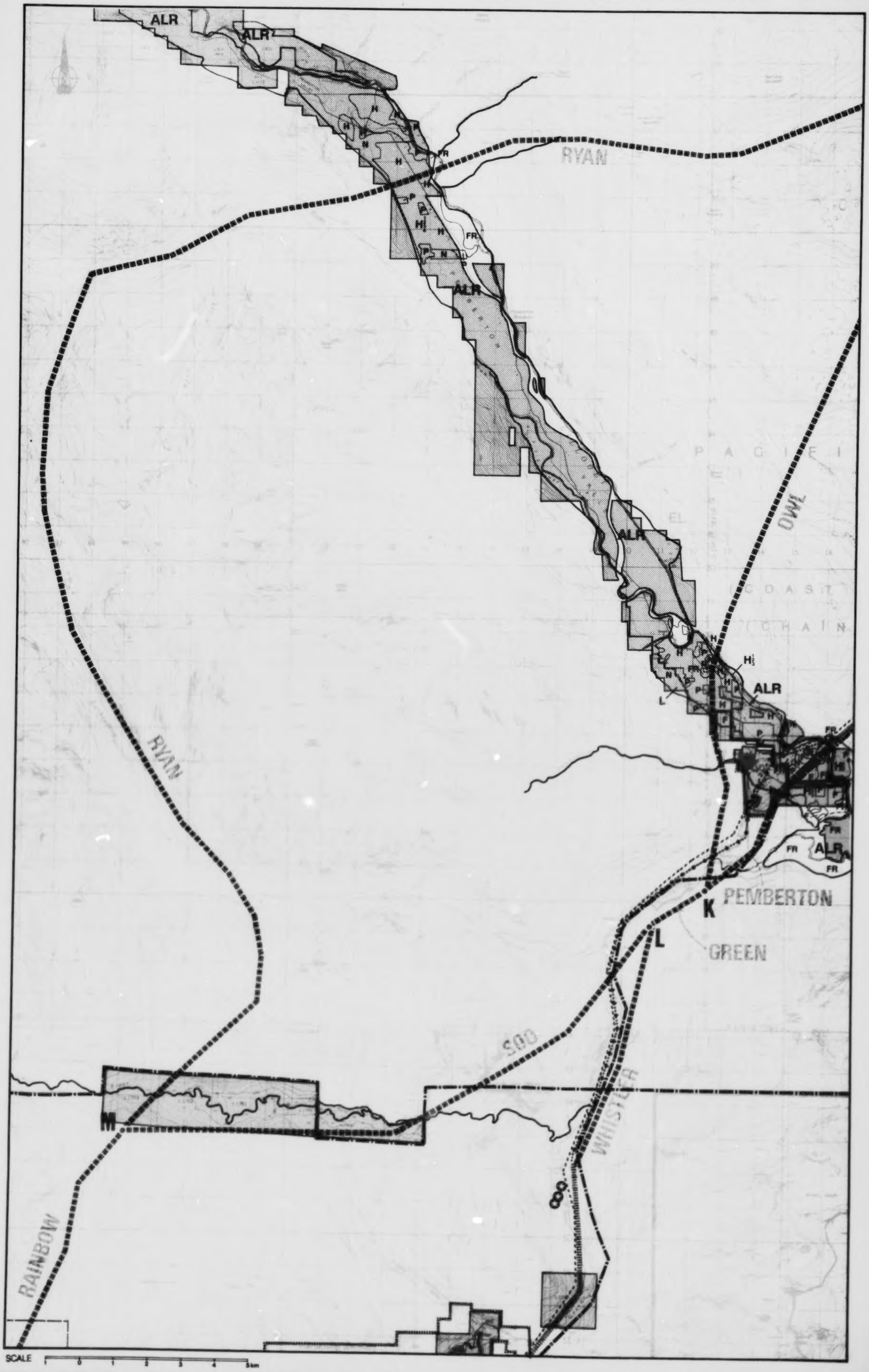
GATES RIVER

LAND USE AND AGRICULTURE



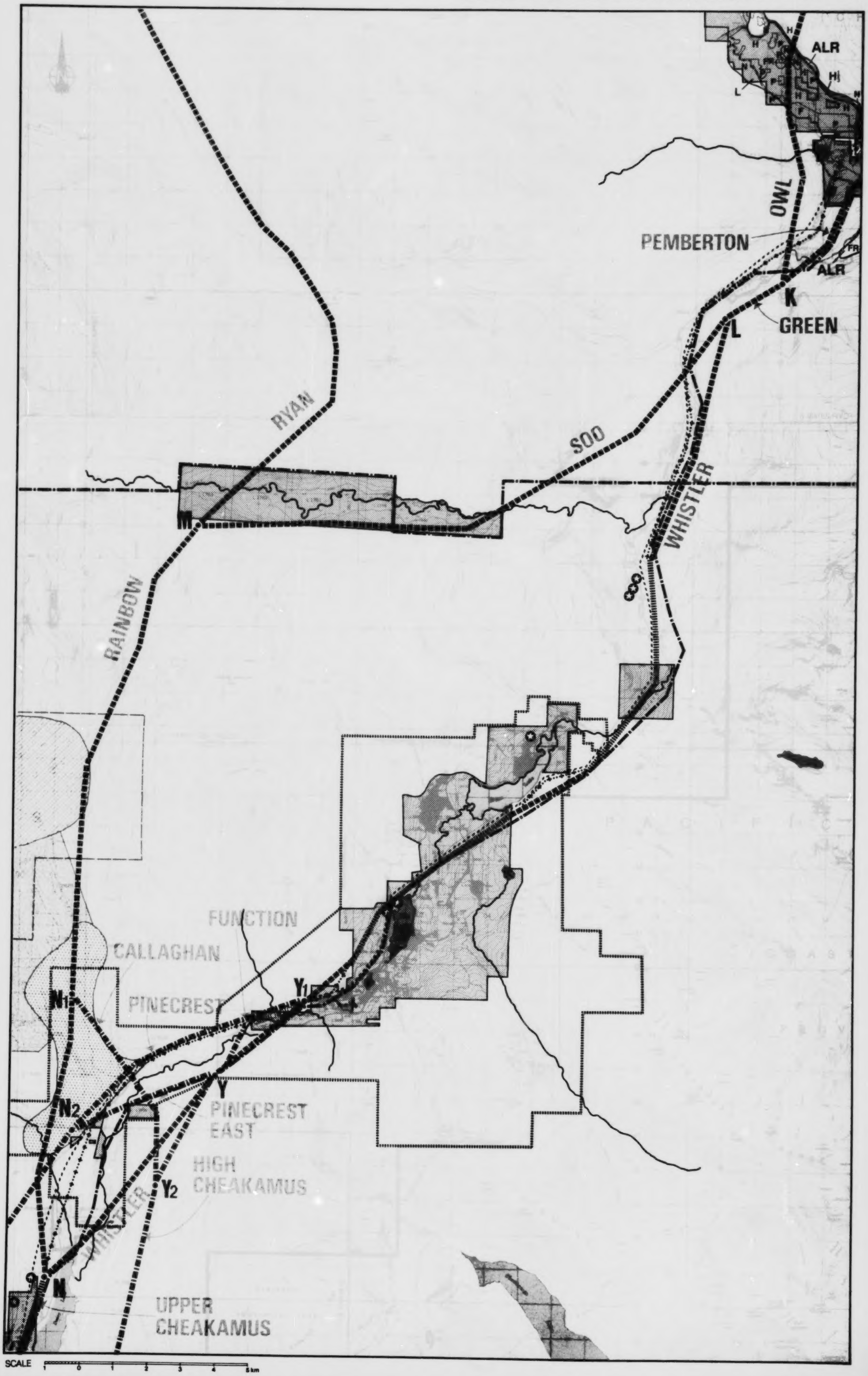
PEMBERTON VALLEY

LAND USE AND AGRICULTURE



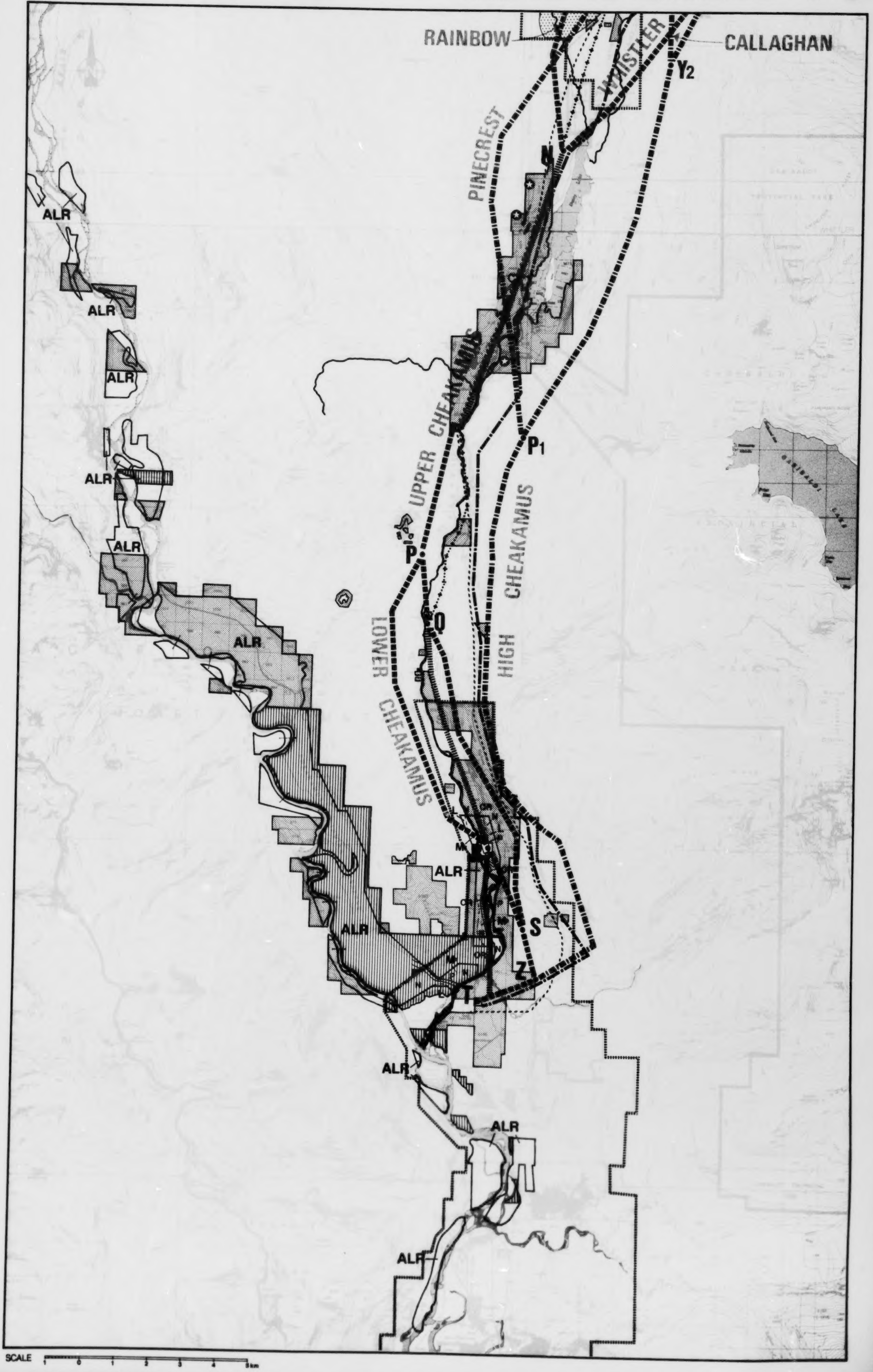
WHISTLER

LAND USE AND AGRICULTURE II-7



CHEAKAMUS

LAND USE AND AGRICULTURE



III

VEGETATION AND FORESTRY

Because forests comprise over three-quarters of the Study Area, vegetation and forestry have been combined in this chapter. After field reconnaissance, existing information was reviewed, including Ministry of Forests (MOF) forest cover maps, maps of biogeoclimatic units and, where available, Canada Land Inventory (CLI) forest capability maps and other published information. Vegetation type units were initially located on 1:50,000 scale forest cover maps and then updated and supplemented by aerial photo interpretation, and field inspections. MOF staff provided valuable information particularly with regard to existing and anticipated forest land tenure and use, and on insect and fire protection matters.

Vegetation types were defined mainly on the basis of aerial photo interpretation and identification of forest cover types, supported by other existing information and ground inspection at approximately 100 sites. Eight biogeoclimatic zones are identified in the Study Area which provide a framework for describing vegetation groupings associated with the contrasting environmental conditions. They are also useful as a basis for determining the appropriate method of revegetation and vegetation maintenance.

General vegetation types were classified as coniferous, mixed and deciduous, mature and immature forests, disturbed or cultivated land (including agricultural land, gravel pits, and ROWs), rangelands, wetlands, talus slopes and areas of exposed bedrock. Forest stands were designated as mature or immature according to their updated age class, as indicated on forest cover maps, and the indicated rotation age for a particular species composition, forest inventory zone and site quality (as classed by the MOF, Inventory Branch). Details of species composition were obtained from forest cover maps, aerial photographs, field reconnaissance and site specific ground inspections.

Areas of sensitive vegetation were identified from field work, aerial photo interpretation, and terrain analysis of the designated Environmental Protection Areas (EPA) shown on forest cover maps. Sensitive sites are defined as areas which may be difficult or slow to revegetate following disturbance because of steepness, erosion, soil or drainage conditions, or adverse local climatic conditions. For the most part, sensitive sites in the Study Area are found on steep slopes with shallow or very coarse-textured soils at high elevations, or on arid sites with southerly aspect.

Vegetation zones and types were located on the working base maps along with additional information on areas of insect infestation and forest land use. Areas of different zones and types were then tallied for each route segment for comparative purposes.

ASSESSMENT

Potential vegetation and forestry impacts from transmission line development were evaluated taking into consideration:

- forest capability considering climate, terrain, and soil conditions;
- existing forest cover and present timber production land use;
- loss of rare or endangered plant species and communities;
- conflicts with Ecological Reserves;
- disturbance of sensitive sites resulting in drastic alteration of plant communities;
- vegetation changes important for recreational or wildlife use;
- loss of productive forest land;
- loss of growing stock, assuming recovery of merchantable timber;
- increased risk of loss by fire, wind, insects and disease;
- interference with logging and forest management plans and operations; and
- conflict with MOF forest research plots.

In most cases the route segment impact potential was apparent from its biophysical characteristics (eg. biogeoclimatic zones, forest cover, terrain) and general knowledge of forestry use for timber production. Consequently, detailed studies of forest use and tenure were not done. Comparison of route alternatives in the Pemberton-Cheekye region, where forest capability is highest in the Study Area, warranted a more detailed investigation of the potential impacts.

IMPACT POTENTIAL RATINGS

The overall impact potential rating of each route alternative represents a judgement of the weighted average of the individual potential impacts along its length; the following definitions are given separately for vegetation and forestry.

VEGETATION

The vegetation types within each route alternative were assigned negligible, low, moderate and high impact potential ratings according to the following criteria:

- Negligible - Construction in an existing cleared BC Hydro ROW, or on land developed for agricultural, industrial or residential purposes, where no new clearing or access roads would be required on undeveloped land, resulting in negligible construction and post-construction maintenance im-pacts on indigenous vegetation communities.
- Low - Assigned where a new route would be constructed adjacent to an existing BC Hydro ROW, no new access roads are required, and the land is undeveloped with no high vegetation values, and where soil moisture deficiency, steep slopes and soil erosion potential are not significant limiting revegetation factors.
- Moderate - Assigned where the construction of a new ROW and/or access roads would be through undeveloped land for which there are no high vegetation values.
- High - Assigned where very sensitive vegetation, or vegetation with high scientific, recreational, aesthetic or wildlife values would be negatively impacted by construction through: steep slope areas and areas where soil erosion potential is high; alpine tundra, mountain hemlock parkland, or Engel-

mann spruce-subalpine fir parkland,where revegetation is extremely slow due to severe high elevation environmental conditions; very dry areas such as the Bunchgrass zone, where revegetation is extremely slow; proposed or existing ecological reserves or parks, or in such close proximity as to cause high negative visual aesthetic impacts; areas which require the filling and/or drainage of wetlands; and vegetation communities containing rare or endangered plant species.

FORESTRY

Forestry impact potential was assessed after allowing for BC Hydro's standard and site-specific environmental protection measures; seven aspects were considered: loss of productive forest land; loss of merchantable timber values; loss of immature growing stock; forest protection concerns; forest land tenure and use; potential disruption of forestry operations; and the presence of environmentally sensitive sites or wilderness values. Each aspect was subjectively rated as low, low-moderate, moderate, moderate-high, or high. An overall impact rating, considering all aspects, was also assigned to each segment. Definitions for negligible, low, moderate and high are given below:

- Negligible:
  - No measurable impact potential exists.
- Low:
  - Little or no productive forest land would be removed from the land base.
  - There is no merchantable timber, or values would be fully recoverable from the few areas where it does occur.
  - Stands of immature timber are absent, poorly stocked, composed of non-commercial species or otherwise cover only small areas.
  - Only general forest protection measures need to be observed; no specific problems are known to exist.
  - No research plots, plantations or forest tenures are directly impacted.
  - Disruption of forestry operations during construction is not foreseeable.
  - No sensitive sites or high wilderness values exist.
- Moderate:
  - Productive forest land impacted is mostly of less than medium site quality.
  - Merchantable timber values would be fully recoverable or are low.
  - Well stocked immature stands of commercial tree species less than 60 years old would be destroyed.
  - Spread of forest insect pests or diseases is unlikely assuming that suitable management practices are observed during ROW clearing and construction.
  - Some forest tenures would be impacted and impacts on plantations or research installations, if any, can be mostly or entirely avoided.
  - Construction activities might interfere with a few forestry operations.
  - Sensitive sites occurring along the corridor would be mostly avoided; wilderness is not directly impacted or values are relatively low.
- High:
  - Medium-good quality growing sites would be removed from the productive forest base.
  - At least some relatively high-value merchantable timber is present and full value may not be recoverable from salvage logging.
  - Well stocked immature stands of commercial tree species, sixty years or older, would be destroyed.
  - It is probable that forest insects or diseases would be spread during ROW clearing and construction.
  - Several forest tenures, plantations or research installations would be directly impacted.
  - ROW construction would likely interfere with active forestry operations.
  - Sensitive sites or adjacent wilderness would be impacted.

BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION

Each route alternative in the Study Area typically is a mosaic of biogeoclimatic ecosystem classification (BEC) zones which occur in a predictable elevational and geographic sequence. The BEC is a hierarchical classification based on vegetation, climate and site characteristics (MOF,1988 and Pojar,1983). It is a modification, by MOF staff, of the classification system developed by Dr. V.J. Krajina (Krajina,1969). The version of the classification and the terminology in this chapter follow Klinka et al.(1984) and Lloyd et al.(1989).

The vegetation and forestry resource assessment is presented mainly at the zonal level of classification. A biogeoclimatic zone is a large, geographic area with a broadly homogeneous macroclimate. Each zone is characterized by a zonal climax plant community and by the pattern of zonal and non-zonal plant communities in the landscape. A zonal site is envisioned as a location where soil water and nutrients are at intermediate levels relative to the range found in the zone. On zonal sites, inputs of water from precipitation, or other sources such as seepage or snowmelt, are thought to be offset by equal rates of soil drainage. The zonal site therefore has a soil water regime and climax vegetation regime that reflect the macroclimate. Non-zonal sites are typically characterized as being wetter or drier relative to the zonal site; they each support different, characteristic, climax plant communities. Sites are also characterized according to their soil nutrient regime relative to zonal sites.

Biogeoclimatic zones are extensive and often exhibit too much variability for some land management applications: therefore, zones have been divided into subzones and the subzones into variants. Currently there are fourteen biogeoclimatic zones recognized in British Columbia (MOF,1988); of these, eight occur in the Study Area: Coastal Western Hemlock (CWH), Interior Douglas-fir (IDF), and Ponderosa Pine (PP), Bunchgrass (BG), Montane Spruce (MS), Engelmann Spruce - Subalpine Fir (ESSF), Mountain Hemlock (MH) and Alpine Tundra (AT). A total of eighteen sub-units (sub-zones and variants) occur as follows: CWH(3), IDF(5), PP(1), BG(1), MS(1), ESSF(4), MH(2), AT(1). Characteristics of the biogeoclimatic units are documented in various references (Klinka et al.,1984; Lloyd et al.,1989; MOF,1988 and 1989; Nuszdorfer et al.,1985; Pojar,1983).

The relationship between the occurrence of Study Area biogeoclimatic units and climatic differences, expressed as differences in elevation and degree of continentality is shown in Figure III-1. Biogeoclimatic zone vegetation species lists are given in the Resource Assessments Report (Talisman, 1990).

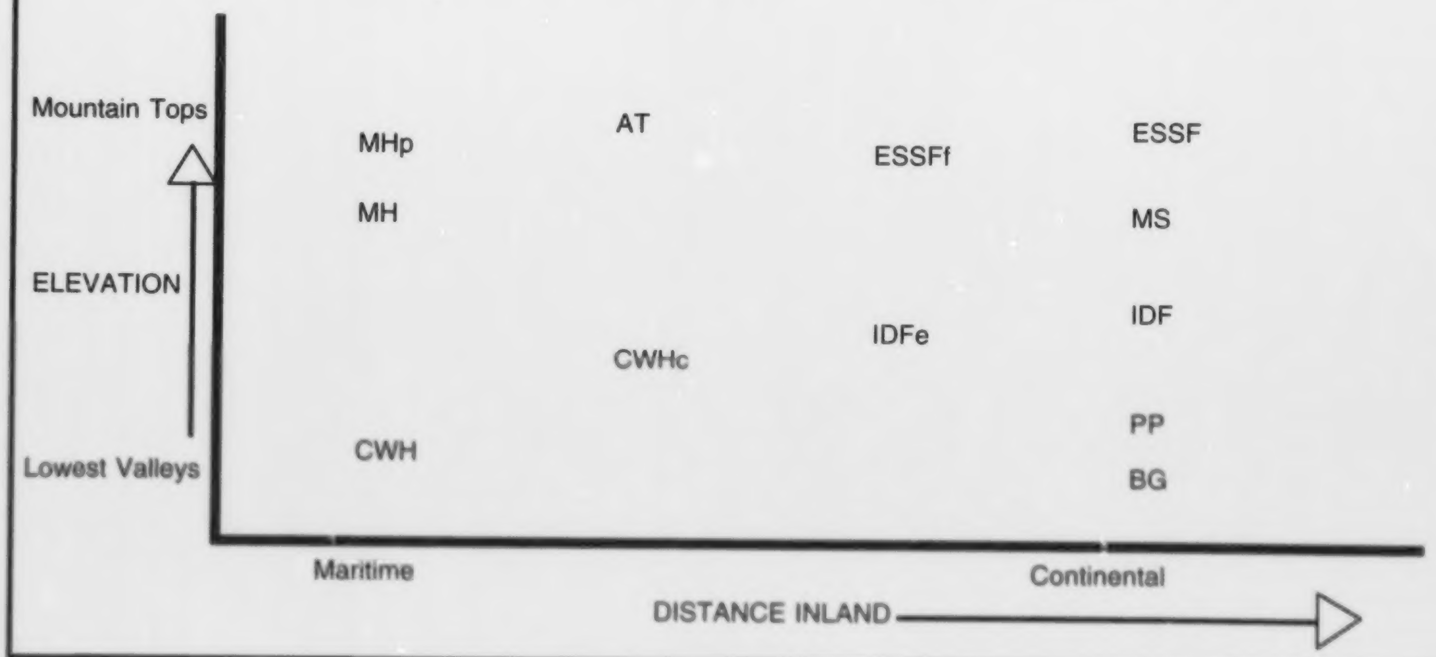
1989 NETWORK

KELLY LAKE (AB) - 6.0 KM

The Kelly Lake (AB) segment begins in the Thompson dry cool IDF variant where the growing season is relatively long and moisture deficits are fairly common. Douglas-fir is the mature climax species, and lodgepole pine the seral species on zonal sites. The understory is dominated by an herb layer of pinegrass and lesser amounts of birch-leaved spirea, soopolallie, twinflower and kinnikinnick. Drier-than-zonal sites support climax Douglas-fir with an open understory of snowberry and bluebunch wheatgrass. Wet-

FIGURE III-1

SOME BIOGEOCLIMATIC UNITS IN RELATION TO ELEVATION AND DISTANCE INLAND



ter-than-zonal sites are characterized by open stands of Engelmann spruce, and a mixed shrub-herb understory with black gooseberry, red osier dogwood and horsetail. A number of topographic and edaphic grassland communities exist within the variant.

Segment AB ascends the Marble Range from the Kelly Lake substation and enters the very dry cool MS zone where the winters are cold, and the summers moderately short and warm with moisture deficits. Climax stands of Engelmann spruce and subalpine fir rarely occur because extensive past forest fires have encouraged mature, open canopy, seral stands. Lodgepole pine is the major seral specie on zonal sites, but there are regenerating Engelmann spruce and subalpine fir. The herb layer of mature seral stands is well developed and dominated by pinegrass and grouseberry and minor amounts of arctic lupine, twinflower and heart-leaved arnica. Mosses are sparse. Drier-than-zonal sites have mature seral stands of lodgepole pine and Douglas-fir, an open mixed shrub-herb community of common juniper, pinegrass and kinnikinnick, with few mosses. Wetter-than-zonal sites are characterized by a dense cover of Engelmann spruce, subalpine fir and lodgepole pine, with a diverse, herb-dominated understory of grouseberry, twinflower, heart-leaved arnica and black gooseberry.

Most of the route crosses poor or low site quality forest lands: Douglas-fir and lodgepole pine are the dominant commercial tree species. Infestations of Mountain Pine Beetle have occurred in some lodgepole pine stands near node B.

The overall vegetation impact potential rating of segment AB adjacent to the existing 5L41/5L42 ROW is low-moderate. Overall potential forestry impact potential is rated low-moderate.

PAVILION (BCEF) - 29.3 KM

The Pavilion (BCEF) segment begins in the Marble Range, descends into the Fraser River valley, and then cuts over Black Hill at the southern end of the Camelsfoot Range, to the Bridge River valley. The route parallels the existing transmission lines through Montane Spruce forest at the higher elevations, and forested range, open range and irrigated forage across the plateau and down the Fraser Valley sideslopes to node C. The Fraser crossing (CE) and suboption CDE cross the lower valley through open range and irrigated forage on the southeast slope, and open range on the northwest. Section CE is adjacent to an existing unoccupied ROW, the majority of suboption CDE traverses an area with no existing transmission line. From node E, the route continues through forested range along the northwest slope of the Fraser Valley and over Black Hill to node F.

The BEC zonation for the descent into the Fraser Valley is identical to that in the Antoine (BG) segment: the progression is from very dry cool MS, to Thompson dry cool IDF, to Thompson very dry hot PP, and, Thompson very dry hot BG variant in the valley bottom.

After crossing the Fraser, segment BCEF ascends Black Hill, through the very dry hot PP and IDF zones, and the Thompson dry cool IDF variant. The route's descent into the Bridge River valley is through the very dry hot IDF. Node F lies in the very dry hot PP zone.

Very dry sensitive sites which have not been irrigated for forage exist within the BG zone of the Fraser Valley bottom, as well as dry sensitive forested sites on the steep slopes of the higher PP zone; revegetation is slow, therefore physical disturbance should be minimized, and reseeding prompt to reduce soil erosion. Reseeding with domestic grasses and legumes within grazing areas would provide forage benefits.

Forest values along segment BCEF are low. Some dry sensitive sites with stands of Douglas-fir and Ponderosa pine occur on steep slopes above the Fraser.

Segment BCEF is adjacent to existing transmission lines, and vegetation impact potential is judged to be moderate; suboption CDE, which is not adjacent to an existing ROW is rated moderate-high. Overall forestry impact potential along segment BCEF and suboption CDE is low.

ANTOINE (BG) - 44.3 KM

The Antoine (BG) segment traverses a forested landscape where no transmission lines currently exist. Segment BG begins in the Marble Range southeast of Kelly Lake, traverses the Fraser and Bridge river valleys and the Camelsfoot Range and then climbs Mission Ridge to node G. The BEC zonation follows a characteristic and repetitive elevational pattern. From mountain top to valley bottom the progression is from dry very cold ESSF, to very dry cool MS, to Thompson dry cool IDF, to Thompson very dry hot PP, and to the Thompson very dry hot BG. The following variations on the pattern also should be noted: the Bridge River valley bottom is within the PP zone, not the BG zone; node B is within the MS zone.

The dry very cold ESSF subzone is characterized by long, cold, winters with heavy snowfall and short cool summers. Subalpine fir and Engelmann spruce are the zonal site climax species, and lodgepole pine and whitebark pine the major seral species. White-flowered rhododendron and black huckleberry dominate the shrubby understorey. Herbs are sparse, but mosses are abundant.

The very dry cool MS subzone is characterized by cold winters and moderately short, warm summers where moisture deficits are common. Climax stands of Engelmann spruce and subalpine fir rarely occur. An extensive history of forest fires has led to a dominance of mature, open canopy, seral stands on zonal sites where lodgepole pine is the major species, and there are minor amounts of regenerating Engelmann spruce and subalpine fir. The herb layer of mature seral stands is well developed and dominated by pinegrass and grouseberry and minor amounts of arctic lupine, twinflower and heart-leaved arnica; mosses are sparse. Drier-than-zonal sites have mature seral stands of lodgepole pine and Douglas-fir, an open mixed shrub-herb community of common juniper, pinegrass and kinnikinnick, and a poorly developed moss layer. Wetter-than-zonal sites are characterized by a dense cover of Engelmann spruce, subalpine fir and the successional species lodgepole pine, and a diverse, herb dominated understory of grouseberry, twinflower, heart-leaved arnica and black gooseberry.

The Thompson dry cool IDF variant is characterized by a warm, dry climatic regime with a relatively long growing season in which moisture deficits are fairly common. Douglas-fir is the mature climax species, and lodgepole pine the seral species on zonal sites. The understorey is dominated by an herb layer of pinegrass and lesser amounts of birch-leaved spirea, soopolallie, twinflower and kinnikinnick. Dry sites support climax Douglas-fir with an open understorey of snowberry and bluebunch wheatgrass. Wetter sites are characterized by open stands of Engelmann spruce, and a mixed shrub-herb understory with black gooseberry, red osier dogwood and horsetail. A number of topoedaphic and edaphic grassland communities also exist within the Thompson dry cool IDF variant.

The Thompson very hot dry PP variant is a mosaic of grassland and forest communities characterized by open stands of Ponderosa pine and an understory of bluebunch wheat grass. Zonal sites with climax vegetation are characterized by open stands of ponderosa pine with a few Douglas-fir, a sparse shrub layer in which Saskatoon and rabbit-brush are the dominant species, and a well developed herb layer dominated by bluebunch wheatgrass and rough fescue and numerous low-cover herbs. On drier sites the understory is predominantly big sagebrush and bluebunch wheatgrass. Rocky outcrops are characterized by a dense cover of compact selaginella and bluebunch wheatgrass, and the presence of lichens. On wetter sites, snowberry, Saskatoon berry and some pinegrass dominate the understory. Floodplains are characterized by black cottonwood, a shrubby understory of snowberry, wild rose and water birch, and a variable herb layer in which pinegrass, Kentucky bluegrass, star-flowered Solomon's-seal and sweet-cicely are common.

The Thompson very dry hot BG variant is a non-forested grassland community characterized by the presence of big sagebrush, pasture sage, rabbitbrush, bluebunch wheatgrass and Sandberg's bluegrass.

As with the Pavilion (BCEF) segment, very dry sensitive sites in the BG zone of the Fraser Canyon bottom, as well as dry sensitive forested sites on the steep slopes of the PP zone above, are of concern; revegetation is slow, therefore physical disturbance should be minimized, and reseeding prompt to reduce soil erosion. As well, sensitive high impact sites occur in the Cavanagh Creek drainage, along Mission Ridge and along Antoine Creek. Most of these sites are characterized by steep slopes and support forests of Douglas-fir, lodgepole pine and other coniferous species. Removal of tree cover may result in accelerated soil erosion and slow revegetation of disturbed areas. Parklands and grasslands along the route are important for wildlife. The Antoine Creek drainage may be a candidate for designation as a recreational forest wilderness.

Most of segment BG is covered with mature or immature coniferous forests. Douglas-fir, sometimes with lodgepole pine, Ponderosa pine or spruce, is a dominant species in most stands. High elevation stands (in the ESSF) are dominated by lodgepole pine and Engelmann spruce. A few mixed stands of immature Douglas-fir and trembling aspen and deciduous, immature stands of trembling aspen occur along the route. Poor quality sites for tree growth comprise about three-quarters of the sites crossed by the route; about one-quarter are medium site quality and these are concentrated on the south side of the Bridge River. As noted previously, Mountain Pine Beetle has been active in some lodgepole pine stands near node B.

Within the Antoine Creek drainage, very little access is developed and terrain is difficult, therefore timber extraction would be costly.

Segment BG is a new route through an undeveloped landscape where overall vegetation impact potential is moderate-high. Overall forestry impact potential is rated as moderate.

MISSION (FG) - 15.0 KM

The Mission (FG) segment begins in the Bridge River valley, and then ascends the Chilcotin Range to Mission Ridge. It requires additional ROW parallel and adjacent to 5L42, which traverses a forested landscape. The BEC zonation is a predictable elevational progression from Thompson very dry hot PP, to Thompson very dry hot IDF, to Thompson dry cool IDF, to very dry cool MS, to dry very cold ESSF (refer to in the Antoine (BG) segment).

Some sensitive, high impact potential areas are crossed within the ESSF of Mission Ridge comprised of alpine and wetland vegetation, and sites which would be relatively difficult to rehabilitate with respect to erosion unless appropriate practices are applied.

The route traverses areas of relatively good forest site quality, particularly in the MS and ESSF zones. On Mission Ridge, in the ESSF, several forest plantations are crossed. The route crosses a Woodlot Licence (WL) and also the Chart Area of a Forest Licence (FL) formerly held by Evans Products Ltd. (now Ainsworth Lumber).

As segment FG is adjacent to 5L42, it has an overall moderate vegetation impact potential. Overall forestry impact potential is rated low-moderate; however appropriate measures would have to be taken with regard to forestry tenures and operations and for reclamation of access roads and construction sites.

DUFFEY (FJ) - 89.0 KM

The Duffey (FJ) segment begins near the intersection of the Bridge and Fraser rivers, and traverses the dry, forested, western sideslopes of the Fraser River valley to Seton River mostly adjacent to 2L90/2L91. From Seton Lake to Lillooet Lake, segment FJ follows the forested Cayoosh Creek valley, Cayoosh Pass and Joffre Creek valley to Lillooet Lake. The Cayoosh valley is narrow, with steep sideslopes on which small pockets of alpine vegetation are a common occurrence. West of Duffey Lake, steep avalanche tracks occur on the northern slope, and pockets of parkland meadow on the floodplain. The vegetation ranges from interior parkland, to interior montane, to coast-interior transition (by Duffey Lake, and the descent through Joffre Creek valley), to interior subalpine forest at Cayoosh Pass. From Lillooet Lake to node J, the route is through forested land adjacent to 3L2.

Node F to Seton Lake

From node F to Seton Lake, the route runs through the Thompson very hot dry PP variant, the driest forested zone in B.C. It is a mosaic of grassland and forest communities characterized by open stands of yellow pine with an understorey of bluebunch wheat grass, and the absence of pinegrass from zonal sites differentiates the PP zone from the adjacent IDF zone. Zonal site climax stands are characterized by open stands of Ponderosa pine with a few Douglas-firs, a sparse shrub layer in which Saskatoon and rabbit-brush are the dominant species, and a prominent herb layer dominated by bluebunch wheatgrass and rough fescue and numerous other herbs. On drier sites the understory is predominantly big sagebrush and bluebunch wheatgrass. Rocky outcrops are characterized by a dense cover of compact selaginella and bluebunch wheatgrass, and the presence of lichens. On wetter sites, snowberry, Saskatoon berry and some pinegrass dominate the understory. Floodplains support black cottonwood, a shrubby understorey of snowberry, rose and water birch, and a variable herb layer in which pinegrass, Kentucky bluegrass, star-flowered Solomon's-seal and sweet-cecily are common.

Seton Lake to Cayoosh Pass

At the eastern end of Seton Lake, segment FJ crosses the 2L90/2L91 ROW and continues up the Cayoosh Creek valley. From Seton Lake to Blowdown Creek near the eastern end of Duffey Lake, the route passes through three subzones of the IDF zone.

The first 4-5 km from Seton Lake to approximately Phair Creek is through the Thompson very dry hot IDF variant. The climatic regime is dry, with a relatively long growing season in which moisture deficits are common. Zonal site climax stands are characterized by Douglas-fir and an understory dominated by pinegrass, although snowberry, birch-leaved spirea, Saskatoon, tall Oregon-grape, red-stemmed feathermoss and electrified cat's tail moss are present. Ponderosa pine frequently occurs in seral stands. Dry site climax stands support Douglas-fir, although on steep south-facing slopes it is intermixed with Ponderosa pine.

Shrubby pentstemon, Saskatoon and birch-leaved spirea are common in the bluebunch wheatgrass dominated understory, and mosses and lichens are sparse. Wet, mature seral sites are characterized by Douglas-fir, hybrid Engelmann spruce, and western red cedar, with an understory of snowberry, Douglas maple, red-osier dogwood with some herbs and few mosses. Wetter sites are dominated by horsetail.

From Phair Creek to midway between Downton and Melvin creeks, (approximately 15 km), the route passes through undifferentiated IDF; IDF and a pinegrass understorey dominate the zonal climax stands. Lodgepole pine is a seral species, and western red cedar and western hemlock are absent. Ponderosa pine occurs on some drier-than-zonal sites.

From midway between Downton and Melvin creeks to Blowdown Creek, the route passes through the Cascade cool dry IDF variant. The climatic regime is warm and dry, with a relatively long growing season in which moisture deficits are common. Zonal site climax stands are characterized by Douglas-fir with a pinegrass understorey. Zonal site mature seral stands support lodgepole pine with Douglas-fir regeneration, a sparse shrub layer of birch-leaved spirea and falsebox, and an understorey dominated by pinegrass and to a lesser extent kinnikinnick, twinflower and red-stemmed feathermoss. The climax stands of drier, south-facing IDF slopes are composed of mature and open stands of Douglas-fir, with a sparse understory of Saskatoon, birch-leaved spirea and bluebunch wheatgrass. Wet-site climax stands contain hybrid Engelmann spruce, with lodgepole pine and Douglas-fir as seral components, and an understorey where red-osier dogwood is the most common shrub. There is no dominant herb, and the mosses are sparse. On even wetter sites, bitter cherry and western red cedar occur with a shrubby understory and a dense cover of sedges.

Between Blowdown and Cerise creeks, the route passes through the southern submaritime wetter CWH variant. Zonal site climax stands contain western hemlock, pacific silver fir, and Douglas-fir, an understory of Alaska blueberry, red huckleberry, black huckleberry, oval-leaved blueberry, falsebox, and false azalea, and a variable herb layer in which star-flowered false Solomon's seal, rosy twisted stalk, one-leaved foam-flower, Queen's cup and one-sided wintergreen are common. The moss layer is well developed. Western white pine is a seral species. On wetter sites, western red cedar is present. On drier sites, subalpine fir occasionally occurs.

From Cerise Creek to North Joffre Creek, up to Cayoosh Pass, the route runs through the wet mild ESSF zone which has long, cold, and winters with heavy snowfall, and short, cool summers. It is distinguished from other zones by the presence of white-flowered rhododendron and Sitka valerian. Zonal site climax stands are characterized by dense and mature stands of subalpine fir, Engelmann spruce, pacific silver fir and the occasional mountain hemlock. The understory is shrubby and dominated by white-flowered rhododendron and black huckleberry. The herb layer in which one-sided wintergreen and five-leaved bramble are common species, is sparse. Mosses also are sparse; some pipecleaner moss and red-stemmed feathermoss occur. Seral species are lodgepole pine, Douglas-fir and whitebark pine. Drier sites are dominated by lodgepole pine, with minor occurrences of subalpine and pacific silver firs, and have an open understory where common juniper and black huckleberry are the major species. Climax stands on wetter sites are characterized by subalpine fir and Engelmann spruce, with minor occurrences of pacific silver fir, western red cedar and mountain hemlock. The understory contains five-leaved bramble, Sitka valerian, one-leaved foamflower, black huckleberry and black gooseberry, with oak fern and horsetails on wetter sites. Mosses are sparse.

Cayoosh Pass to Node J

From Cayoosh Pass, the route descends to Lillooet Lake through the southern maritime wetter CWH variant described between Blowdown and Cerise creeks. From Lillooet Lake to Node J, the route traverses the Lillooet Valley northern sideslopes through the southern subcontinental IDF variant. Interior Douglas-fir and a pinegrass understorey dominate zonal climax stands, but both western red cedar and western hemlock are present in zonal to wetter sites, and Ponderosa pine may occur in drier sites. Lodgepole pine is a successional species.

Impact Potential

Between node F and Seton Lake, the route runs mainly adjacent to an existing ROW along sideslopes within the dry, PP zone, where revegetation is slow, and appropriate practices must be applied to minimize erosion. The central two-thirds of segment FJ traverses the lower slopes and floodplain of the narrow Cayoosh valley, where no transmission lines exist; it features glacier views, avalanche tracks and pockets of alpine vegetation on the sideslopes, and wetlands, meadows, Duffey Lake, the Cayoosh and Joffre creeks on the valley bottom. A well used recreation site which marks the beginning of a trail to the Lower, Middle and Upper Joffre Lakes and Joffre Glacier would be adjacent to the ROW.

In many and various locations along segment FJ, steep slopes with coarse-textured, sometimes shallow soils may require special attention for erosion control along access roads and construction sites. Snow avalanche tracks along Cayoosh Creek in the general vicinity of Duffey Lake may pose some difficulties in re-establishing vegetation following disturbance.

The route crosses near many relatively high quality sites and several forest plantations and thinned stands, mainly between about the mouth of Gott Creek and Upper Joffre Creek. Most areas of merchantable timber along the route have already been logged; those that haven't should be avoided, or, if unavoidable, should be salvaged.

The overall vegetation impacts potential for segment FJ is moderate-high. Forestry impact potential is judged to be moderate-high .

ANDERSON (GH) - 39.5 KM

The Anderson (GH) segment begins at the high elevation on Mission Ridge, descends through Mission Pass, and traverses sideslopes above Seton and Anderson lakes, declining in elevation to a point south of Seton Portage; it continues southwest along the lakeside to the south end of Anderson Lake near the intersection of Blackwater Creek and Gates River.

The BEC zonation follows a predictable elevational pattern. At node G segment GH is within the dry very cold subzone which is characterized by long, cold, winters with heavy snowfall and short cool summers. Subalpine fir and Engelmann spruce are the climax species, and lodgepole pine and whitebark pine the major seral species. White-flowered rhododendron and black huckleberry dominate the shrubby understorey. Herbs are sparse, but the mosses are abundant.

As the route descends to Seton Portage, it first enters the very dry cool MS zone characterized by cold winters and moderately short, warm summers where moisture deficits are common. Climax stands of Engelmann spruce and subalpine fir rarely occur. Extensive past forest fires have led to a dominance of mature, open, seral stands on zonal sites where lodgepole pine is the major species, and there are minor amounts of Engelmann spruce and subalpine fir regenerating beneath the canopy. The herb layer of mature seral stands is prominent and dominated by pinegrass and grouseberry with minor amounts of arctic lupine, twinflower and heart-leaved arnica. Mosses and lichens are few. Drier-than-zonal sites have mature seral stands of lodgepole pine and Douglas-fir, an open mixed shrub-herb community of common juniper, pinegrass and kinnikinnick, and few mosses and lichens. Wetter-than-zonal sites are characterized by a dense cover of Engelmann spruce, subalpine fir and lodgepole pine, with a diverse, herb-dominated understory of grouseberry, twinflower, heart-leaved arnica and black gooseberry.

From the very dry cool MS subzone, segment GH traverses Mission Pass into the Cascade dry cool IDF variant. Zonal site climax stands are characterized by Douglas-fir with a pinegrass understorey. Lodgepole pine is the dominant seral species. Drier sites support mature and open stands of Douglas-fir, with a sparse understorey of Saskatoon, birch-leaved spirea and bluebunch wheatgrass, and a sparse moss layer. Wet site climax stands contain hybrid Engelmann spruce with lodgepole pine and Douglas-fir as seral components, and an understory where red-osier dogwood is the most common shrub. There is no dominant herb, and mosses and lichens are sparse.

The route follows the north side of Anderson Lake, through the undifferentiated IDF zone to the Blackwater Creek/Gates River intersection. Interior Douglas-fir and a pinegrass understory dominate the zonal climax stands. Lodgepole pine is a seral species, and Ponderosa pine occurs on drier-than-zonal ecosystems.

Most of segment GH passes through areas of poor forest site quality. Better quality sites occur sporadically along the route, mainly along creeks and on lower slopes receiving seepage water from above. The MOF anticipates development of merchantable timber areas along the route beginning about 1993.

Segment GH runs adjacent to existing transmission lines and overall vegetation impact potential is rated moderate. Overall forestry impact potential is rated low-moderate.

BIRKENHEAD (HI) - 20.0 KM

The Birkenhead (HI) segment extends from the Gates River valley, northwest along Blackwater Creek to Birkenhead Lake, and along the east side of the lake. It crosses a landscape where no transmission lines exist.

From node H in the warmer and lower elevation valley bottom to approximately 5 km up Blackwater Creek valley, the route is within the undifferentiated Interior Douglas-fir zone where Interior Douglas-fir and a pinegrass understorey dominate zonal climax forests, and birch-leaved spirea, Saskatoon, kinnikinnick, soopolallie, falsebox, tall Oregon-grape, baldhip rose, Douglas maple and red-osier dogwood are characteristic shrubs. Ponderosa pine occurs on drier sites at lower elevations, and lodgepole pine is a seral species.

A short distance up the Blackwater Creek valley, the route enters the southern submaritime wetter CWH variant, and remains within it to node I at the southern end of Birkenhead Lake. Zonal site climax stands contain western hemlock, pacific silver fir, and Douglas-fir, an understory of Alaska blueberry, red huckleberry, black huckleberry, oval-leaved blueberry, falsebox, and false azalea, and a variable herb layer in which star-flowered false Solomon's seal, rosy twisted stalk, one-leaved foam-flower, Queen's cup and one-sided wintergreen are common. Mosses are few. Western white pine is a seral species. On wetter sites, western red cedar is present. On drier sites, subalpine fir occasionally occurs.

Segment HI traverses the undeveloped lower south slopes of the Birkenhead Valley and Birkenhead Lake Provincial Park. Sensitive, erosion susceptible sites occur, particularly on the gullies and steep south slopes of Birkenhead Lake which would require appropriate management techniques.

The route passes through WL 40 at the junction of the Birkenhead River and Blackwater Creek and then through areas devoted to the Small Business Forestry Enterprise Program as well as through the provincial park along Birkenhead Lake. Most of the route crosses productive forest land.

Forest sites along the route are mainly of poor quality but they support diverse stands typical of some coastal-interior transitional areas. In the upper Blackwater drainage and along Birkenhead Lake tree species are Douglas-fir, western white pine, western red cedar, ponderosa pine, subalpine fir, western white birch, red alder and trembling aspen. White pine blister rust has infected many western white pine trees although others are vigorous and appear to be rust-free. Clearing for a transmission line might encourage proliferation of Ribes species, the rust's intermediate host, and also might create more opportunities for infection due to physical damage incurred during falling and clearing operations. To the extent that this does occur, reduced growth rates and mortality of western white pine would occur. Opening up the stands along Birkenhead Lake also would increase the risk of windfall.

Overall, the vegetation impact potential is rated moderate-high in segment HI and forestry impact potential is rated moderate.

GATES (HJ) - 27.5 KM

The Gates (HJ) segment runs southwest along the Gates and Birkenhead valleys as do the highway, railway and existing transmission lines. From node H to Pemberton Pass, the majority of the route is new, and runs across forested sideslopes. The 2L1 ROW is used from Pemberton Pass to node J.

Segment HJ is entirely within the IDF zone. From node H near the intersection of Blackwater Creek and Gates River, to the east end of Gates Lake, the route runs through undifferentiated IDF, and from the north end of Gates lake to node J through southern subcontinental IDF. Interior Douglas-fir dominates zonal climax forests in both subzones. However, in the undifferentiated IDF zone, western red cedar and western hemlock are absent, and Ponderosa pine occurs on drier-than-zonal ecosystems at lower elevations. In the southern subcontinental IDF zone, western red cedar and western hemlock are present in zonal and wetter ecosystems, and Ponderosa pine may occur on drier-than-zonal ecosystems.

Sensitive sites which would require appropriate erosion control measures do occur on some steep slopes above the Gates River valley.

There is considerable forestry activity in some of the side drainages along the route (notably WL 40, FL A19211, Weldwood of Canada and Small Business Program timber sales). Small areas of medium site quality occur sporadically along the route. The Mountain Pine Beetle has been active in the past in lodgepole pine stands in the Spetch Creek drainage. Beetle control might be a concern with regard to logging and clearing operations in the area; this would need to be checked in advance with the MOF; 5L46 in this route would probably cross through part of WL 40 and some form adjustment of the tenure would be required.

Approximately half of segment HJ is on the 2L1 ROW, and the overall vegetation impact potential is low-moderate. Overall forestry impact potential is judged to be low-moderate.

OWL (IK) - 25.0 KM

The Owl (IK) segment traverses a largely forested landscape (other than the Pemberton Valley) where there are no existing transmission lines. The route begins at the southern end of Birkenhead Lake, and runs southwest across the Birkenhead River valley and its southwestern sideslopes to Fowl Creek, climbs across a forested subalpine landscape with several lakes, descends into the Owl Creek valley with its numerous small lakes, climbs Mount Fraser, and descends into the Lillooet River valley. The route then cuts south across the Pemberton Valley, across its sideslopes to the intersection of the Green River, then traverses down to node K in the Green River valley, immediately south of Nairn Falls.

The BEC zonation in segment IK follows a characteristic elevational pattern. The route begins in the southern drier submaritime CWH variant where western hemlock and Douglas-fir dominate, and western red cedar, western white pine and western yew are minor species of the zonal climax ecosystems. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understory shrubs.

The route descends into the Birkenhead River valley and the southern subcontinental IDF variant. Interior Douglas-fir is the dominant climax species. Western red cedar and western hemlock are present in zonal and wetter sites, and Ponderosa pine may occur on drier sites.

From the Birkenhead floodplain, the route ascends its southern sideslopes into the southern drier submaritime CWH variant (described for node I), and then the southern submaritime wetter CWH variant. The southern submaritime wetter CWH variant is characterized by climax stands of western hemlock, pacific silver, and Douglas-fir, and an understory of Alaskan blueberry, red huckleberry, black huckleberry, oval-leaved blueberry, falsebox, and false azalea. The herb layer is variable, but star-flowered false Solomon's seal, rosy twisted stalk, one-leaved foam-flower, Queen's cup and one-sided wintergreen are common, and the moss layer is prominent. Western white pine is a seral species, and, on wetter-than-zonal sites, western red cedar is present. On drier-than-zonal sites, subalpine fir occasionally occurs.

At approximately Fowl Creek segment IK enters the southern subcontinental ESSF subzone where Engelmann spruce and subalpine fir are the dominant climax species. Mountain hemlock and pacific silver fir are sometimes minor species, and lodgepole pine may be present as a successional species. Grouseberry, kinnikinnick, falsebox, birch-leaved spirea, black huckleberry and white-flowered rhododendron are common understory shrubs.

Segment IK leaves the ESSF forest and goes down into the Owl Creek Valley in the southern submaritime wetter CWH variant after which it re-enters the subcontinental forested ESSF subzone at the elevational peak (Mount Fraser) of the southwestern Owl valley sideslope. From here, the route descends into the Lillooet River

Valley through the subcontinental forested ESSF, the southern submaritime wetter CWH, southern subcontinental IDF and southern drier submaritime CWH, and continues on to node K in the southern drier submaritime CWH: the same zonation sequence described at the beginning of the segment.

Wilderness recreational potential is high in the upper Fowl and Owl Creek drainages, and is an overriding consideration in vegetation impact assessment of segment IK. Some sensitive sites occur on steep slopes and other high elevation areas with shallow soils where appropriate procedures would be required to minimize erosion.

The route passes through or near several forest tenures including a Small Business Forestry Enterprise Program areas south of Birkenhead Lake and Timber Sale 20891 (Lebowe Bros.).

Other than its passage through the Pemberton Valley, segment IK traverses a largely undeveloped landscape with no existing ROW, and overall vegetation impact potential is high. Overall forestry impact potential in segment IK is rated as moderate.

RYAN (IM) - 57.0 KM

The Ryan (IM) segment traverses a diverse, mostly forested landscape, except for the Pemberton valley floodplain along which there are no existing transmission lines.

Segment IM begins at the southern end of Birkenhead Lake heading west and then south, traversing the Birkenhead, Lillooet, Rutherford, and Soo valleys, and the intervening mountain ranges to node M. Subalpine parkland is crossed at the highest elevations of each mountain range. These areas, because of the harsh climate and short growing season, are relatively sensitive to disturbance. The most notable of these is a subalpine valley of parkland, lakes and wetlands, located between Sungod Mountain and Mount Ronayne northeast of the Pemberton Valley. The higher elevation habitats on either side of this valley and the route progress from parkland to alpine tundra.

The BEC zonation of segment IM follows a characteristic elevational pattern as it descends into the valleys, ascends the valley sideslopes and traverses the alpine. Throughout its length, the BEC zonation pattern is a multiple repetition of that of segment IK. The following differences however, should be noted:

- An undifferentiated AT zone and subalpine parkland is traversed at the highest elevations which is non-forested and characterized by low-growing herbs and shrubs at the lower elevational limits, and lichens, mosses and liverworts at the upper elevations. Parkland is characterized by a clumped distribution of trees.

- Northeast of the Pemberton Valley, parkland ESSF is associated with the AT. The tree distribution is clumped where early snow melt occurs, and the treeless open areas are characterized by an extensive heath cover of species such as pink and white mountain heathers, and, in-stream and lakeside habitats, by lush subalpine meadow species such as leatherleaf saxifrage, sweet coltsfoot, alpine white marsh-marigold, Indian false hellebore, broad-leaved willowherb, red monkey flower, mountain arnica and subalpine daisy. Southwest of the Pemberton Valley, parkland MH is associated with the AT. In the parkland MH trees grow in clumps, and mountain hemlock and subalpine fir are the major climax species. The treeless open areas are characterized by an extensive heath cover of species such as pink and white mountain heathers. Stream and lakeside habitats of the parkland subzone are characterized by lush subalpine meadow vegetation including species such as leatherleaf saxifrage, sweet coltsfoot, alpine white marsh-marigold, Indian false hellebore, broad-leaved willowherb, red monkey flower, mountain arnica and subalpine daisy.

- West of the Pemberton Valley, submaritime forested MH replaces the subcontinental forested ESSF. In the submaritime forested MH zone, the tree cover is continuous, and mountain hemlock and pacific silver fir are the major climax species, although western hemlock and subalpine fir are also present.

- Southern subcontinental IDF is not found in the valley bottoms southwest of the Pemberton Valley.

- Node M is within the southern submaritime wetter CWH zone.

No transmission lines currently exist in the mainly forested landscape which is characterized by sensitive subalpine parkland at the highest elevations of each of the three mountain ranges crossed. The subalpine parkland, lakes and wetlands between Sungod Mountain and Mount Ronayne are particularly aesthetic with high wilderness recreational potential. Subalpine parkland, adjacent alpine tundra, and high elevation steep slopes are susceptible to erosion during and following construction, as the harsh environmental conditions result in extremely slow revegetation.

Segment IM passes through or near the Chart Area for FL A19215 (Terminal Forest Products) in the Ryan River drainage and FL A19210 (Scott Paper) on the east side of the Lillooet River valley, Chart Area A19216 (CPFD) in the Rutherford Creek drainage, and Chart Area FL A19217 (A&R Logging) in the Soo Valley. About sixty percent of the route is productive forest land with mature and immature forests occupying about equal areas. About eighty percent of the productive forest land is of poor site quality. The main commercial tree species are western hemlock, mountain hemlock, pacific silver fir, western red cedar and Douglas-fir.

The overall vegetation impact potential is high for segment IM and the overall forestry impact potential along segment IM is moderate-high.

PEMBERTON (JK) - 10.0 KM

The Pemberton (JK) segment utilizes the 2L1 ROW from node J to the Lillooet River floodplain. From the floodplain to node K, the route is new and is adjacent to 5L42 through the agricultural land of the floodplain, and then over forest over land to node K.

Segment JK begins in the undifferentiated IDF zone. From node J, the route runs southwest through the undifferentiated IDF zone to the Pemberton Valley and Lillooet River floodplain. Within the Lillooet River floodplain, and through to the node J terminus, the route is within the southern drier submaritime CWH variant; western hemlock and Douglas-fir dominate, and western red cedar, western white pine and western yew are minor species of zonal climax ecosystems. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understory shrubs.

The route utilizes an existing ROW for approximately half its length and runs adjacent to an existing ROW through the agricultural land of the Pemberton Valley for another quarter length. The primary vegetation concerns would be the steep slopes of Signal Hill north of Nairn Falls Provincial Park and at node K which would require appropriate vegetation management procedures to minimize soil erosion.

Segment JK passes through WL 15 and crosses areas of mainly poor site quality forest land. The main forestry impact potential is on WL 15; this could be minimized by refining the alignment.

The overall vegetation impact potential is low in segment JK and forestry impact potential is judged to be low-moderate.

GREEN (KL) - 2.0 KM

The Green (KL) segment traverses the forested southeast sideslope of the Green River valley between Nairn Falls and Tisdall. The existing transmission lines and highway are on the northwest slopes.The route runs through the southern drier submaritime CWH zone. Western hemlock and Douglas-fir are dominant, and western red cedar, western white pine and western yew are minor climax species of the zonal ecosystems. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understorey shrubs. Erosion sensitive sites occur along the Green River.

Segment KL passes by several adjacent forestry tenures including FL A19216 (CPFP) and a Small Business Forestry Enterprise program area. Sensitive sites occur on some steep slopes southwest of Nairn Falls Park and along the Green River. Some areas of medium site quality also occur sporadically along the route. A research installation (E.P. 599.03) and a forest plantation occur along the route near Tisdall.

The overall vegetation impact potential is moderate for this short route which is located in the same corridor, but on the opposite side of the river, as the highway and existing transmission lines. The overall forestry impact potential is rated low.

SOO (LM) - 18.0 KM

The Soo (LM) segment begins near Tisdall on the east slope of the Green River valley, and cuts southwest, primarily through forested land, across the valley and knoll on the western side to the Soo River valley where there are no existing transmission lines. The route then runs west along the Soo floodplain and lower southern sideslope to its terminus at node M through a recently clearcut logged landscape. A forested buffer strip has been retained on either side of the Soo, and there are extensive wetlands on the floodplain.

Segment LM is all within the CWH Zone, beginning in the southern drier submaritime CWH, and ending at node M in the southern submaritime wetter CWH. The southern drier submaritime CWH, is characterized by climax stands of western hemlock and Douglas-fir. Western red cedar, western white pine and western yew are minor species. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understory shrubs. In the southern maritime wetter CWH western hemlock, pacific silver fir, and Douglas-fir are the major climax species, occurring with an understory of Alaskan blueberry, red huckleberry, black huckleberry, oval-leaved blueberry, falsebox, and false azalea. The herb layer is variable in composition, but star-flowered false Solomon's seal, rosy twisted stalk, one-leaved foam-flower, Queen's cup and one-sided wintergreen are common. Mosses are abundant. Western white pine is a seral specie, and on wetter-than-zonal sites, western red cedar is present. On drier-than-zonal sites, subalpine fir occasionally occurs.

There is no existing ROW along segment LM, the western half of which crosses and runs adjacent to the extensive and sensitive wetlands of the Soo floodplain. Sensitive steep slope areas occur along the route at the knoll between the Soo and Green river valleys, and at node M.

Segment LM passes through and adjacent to several forest tenures, namely TSL A20482 (AC and CC Le Blanc) and Chart Areas for FL's A20541 (Richmond Plywood) and A19217 (A&R Logging). Nearly all of the route crosses productive forest land of which about fifteen percent is of medium or good site quality. Some old growth stands of Douglas-fir, western red cedar, pacific silver fir and western hemlock with an average stand height of about fifty m occur in good quality sites along the Soo River.

Overall vegetation impact potential is moderate-high in segment LM and forestry impact potential is rated high.

WHISTLER (LN) - 37.0 KM

The Whistler (LN) segment runs along the Green and Cheakamus valleys from Tisdall to Daisy Lake. Some sections pass through primarily forested sideslopes, while others may utilize the 2L1 ROW.

Segment LN begins near the Rutherford Creek/Green River confluence and runs southwest along the Green River valley past Green, Alta, Nita and Alpha lakes to node N, just south of Brandywine Falls. The route is within the CWH Zone for its entire length. The majority of it is within the southern submaritime wetter CWH variant, which is characterized by climax stands of western hemlock, pacific silver fir, and Douglas-fir, and an understory of Alaskan blueberry, red huckleberry, black huckleberry, oval-leaved blueberry, falsebox, and false azalea. The herb layer is variable in composition, but star-flowered false Solomon's seal, rosy twisted stalk, one-leaved foam-flower, Queen's cup and one-sided wintergreen are common. Mosses are abundant. Western white pine is a seral species, and on wetter-than-zonal sites, western red cedar is present. On drier-than-zonal sites, subalpine fir occasionally occurs. The route, however, begins and ends in the southern drier submaritime CWH zone, where western hemlock and Douglas-fir dominate, and western red cedar, western white pine and western yew are minor species of the zonal climax ecosystems. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understory shrubs.

Sensitive forest sites occur in a few areas along the route, namely steep slopes near the north end of Daisy Lake and in wetlands near the mouth of Rethel Creek and between Green and Alta Lakes, and along Miller Creek. The route passes through Whistler near a number of forestry tenures including Small Business Forestry Enterprise Program areas and Chart Areas for FL's A19216 (Canadian Pacific Forest Products) and A19215 (Terminal Forest Products). Several forest plantations also occur. Small areas of medium and good site quality occur along the route.

The overall vegetation impact potential is low-moderate for segment LN which is located in the existing utility corridor, and utilizes many sections of the 2L1 ROW from node L to Alpha Lake. Overall forestry impact potential is rated moderate.

RAINBOW (MN) - 37.0 KM

The Rainbow (MN) segment crosses a landscape where there are no existing transmission lines. The route begins on the southern sideslope of the Soo River valley, heads southwest through Rainbow Pass to the Callaghan River valley where extensive clearcut logging has occurred, and then south down the valley to the Cheakamus River valley, south of Brandywine Falls.

The BEC zonation of segment MN follows a characteristic elevational pattern as it ascends the Soo Valley sideslopes, traverses the alpine terrain west of Rainbow Mountain, and descends into the Callaghan and Cheakamus valleys. The BEC zonation pattern is the same as that of the Ryan (IM) segment as it traverses the Rutherford and Soo valleys and intervening mountain range.

Segment MN begins within the southern submaritime wetter CWH discussed in segment LM, and climbs the submaritime forest MH zone. The tree cover is continuous, and mountain hemlock and pacific silver fir are the major climax species, although western hemlock and subalpine fir are also present.

Beyond the 1200-1400 m elevation range, segment MN enters a zone of parkland MH and AT. Within parkland MH, trees grow in clumps, and mountain hemlock and subalpine fir are the major climax species. The treeless open areas are characterized by an extensive heath cover of species such as pink and white mountain heathers, and stream and lakeside habitats of the parkland subzone by lush subalpine meadow species such as leatherleaf saxifrage, sweet coltsfoot, alpine white marsh-marigold, Indian false hellebore, broad-leaved willowherb, red monkey flower, mountain arnica and subalpine daisy. The AT zone, generally found at elevations in excess of 1650 m, is a non-forested ecosystem characterized by low-growing herbs and shrubs at the lower elevational limits, and lichens, mosses and liverworts at the upper elevations.

As it descends into the Callaghan River valley, segment MN runs through the submaritime forested MH and then the southern submaritime wetter CWH variant. At the node N terminus in the Cheakamus River valley, segment MN enters the southern drier submaritime CWH zone.

No transmission lines currently exist in this wilderness area in close proximity to Whistler, and impact emphasis is placed on the very sensitive high elevation parkland and steep slopes of the pass west of Rainbow Mountain, which are highly susceptible to erosion due to the harsh environmental conditions which result in extremely slow revegetation.

The route passes through the Chart Areas for FL's A19217 (A&R Logging) and A19216 (Canadian Pacific Forest Products). Much of the route crosses productive forest lands with a relative abundance of medium and good quality sites. Numerous forest plantations occur, particularly in the lower portion of the Callaghan River valley. Some sensitive sites that may be difficult to revegetate and can be prone to erosion occur on some steep slopes at high elevations in the MH parkland and AT.

Segment MN has high overall vegetation impact potential, and the contributing factors are similar to those discussed in the Ryan (IM) segment; forestry impact potential is rated high.

UPPER CHEAKAMUS (NP) - 12.8 KM

The Upper Cheakamus (NP) segment follows the Cheakamus River valley from Brandywine Falls to node P, at the south end of the canyon. The northern section follows the 2L1 ROW but at the head of the canyon the route changes onto the sidehill on the west side of the canyon, leaving the 2L1 ROW on the east side.

Segment NP is entirely within the CWH zone, and the majority lies within the southern drier submaritime CWH variant, where western hemlock and Douglas-fir are dominant, and western red cedar, western white pine and western yew are minor climax species on the zonal sites. Falsebox, twinflower, kinnikinnick, ocean spray, prince's pine, black huckleberry and Douglas maple are typical understory shrubs. Scant vegetation on the rocky areas along the upper Cheakamus Canyon are important aesthetically, and sensitive sites associated with potential soil erosion occur on the steep west slopes of Daisy Lake. These rocky areas have a low timber production potential. Sensitive sites associated with potential soil erosion on steep slopes occur along the west side of Daisy Lake.

The overall vegetation impact potential is low for segment NP, approximately two-thirds of which would use 2L1 ROW; forestry impact potential is rated low.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

The Lower Cheakamus (PQRT) segment runs from the downstream end of the Cheakamus Canyon to Cheekye. These are three suboptions: PR on the west sidehill of the valley; QS on the east sidehill; and RST at the south end.

Segment PQRT and its suboptions are within the Pacific Ranges drier maritime CWH variant: western hemlock, Douglas-fir and western red cedar are major species, and western yew and western flowering dogwood minor climax species. Western white pine occurs on drier-than-zonal ecosystems, and grand fir on wetter and richer than zonal ecosystems. Salal, red huckleberry, trailing blackberry, vine maple and dull Oregon grape are typical understory shrubs.

Section PQR has a low vegetation impact potential rating, and is preferred over the PR and QS suboptions, as the majority of PQR utilizes the existing 2L1 ROW. PR and QS both have moderate vegetation impact potential ratings, but QS is preferred as the route is on the same side of the Cheakamus River as Highway 99 and the existing transmission ROW. A small wetland occurs within QS near the mouth of Culliton Creek which was observed to be very silty during 1989 due to natural slope failures in its headwaters. At the south end of the route, RT which utilizes the existing 2L1 ROW, has negligible vegetation impact potential, and is preferred over ST or RST which have moderate impact potential ratings.

Segment PQRT passes through and adjacent to Chart Areas for FL A19215 (Terminal Forest Products) and WL 27. While much of the route crosses productive forest land, most of the route would be on existing 2L1 ROW. Medium and better quality sites are scattered along the route and occupy roughly one-quarter of the productive forest land; most of these sites are on soils derived from alluvial landforms that are most common south of the mouth of Culliton Creek. Some detailed consideration would have to be given to how to avoid or minimize impacts on WL 27, located adjacent to PQR.

The overall vegetation impact potential for segment PQRT ranges from low if PQRT (which mostly would use 2L1 ROW) were chosen, to moderate in the case of the three suboptions. Overall forestry impact potential is rated as moderate-high for suboptions PR and QS, low-moderate for suboption RST and low for PQRT on the 2L1 ROW.

1990 ALTERNATIVES

ORE (UV) - 38 KM

From a vegetation perspective, the Ore (UV) segment is similar to the mid-section of the Antoine (BG) segment; the characteristic repetitive elevational pattern of BEC zonation is much the same as that of segment BG. At node U, located at the top of the Fraser River valley western sideslope, segment UV begins in the Thompson very dry hot IDF. As the elevation increases, it progresses through the Thompson dry cool IDF, the very dry cool MS, and approximately 13 km of the dry very cold ESSF zone at elevations greater than approximately 1,525 m. Segment UV then descends through the very dry cool MS into the Thompson dry cool IDF of the Ore Creek valley, and the Thompson very dry hot IDF of the Yalakom River valley bottom. From here, the route heads southeast along the Yalakom valley's western plateau through the Cascade dry cool and Thompson very dry hot IDFs, to the Thompson very dry hot PP of the Bridge River valley bottom. Segment UV continues southeast from the Bridge River crossing through the Thompson very dry hot and Thompson dry cool IDFs to node V.

Of particular concern are dry sensitive forested sites on the steep slopes of the PP zone, and high elevation sites in the ESSF zone, where revegetation is slow and soil erosion potential is high.

Timber values are high and forestry land-use is relatively intense along segment UV from node U to the beginning of the Ore Creek drainage. The route passes through a Chart Area of Ainsworth Lumber. Some logging has occurred in the Ore Creek drainage. Stands of mature Engelmann spruce, subalpine fir and lodgepole pine and recent logging clearcuts are crossed by the route.

Segment UV would be a new route where no transmission lines currently exist; like segment BG, the overall vegetation impact potential is moderate-high. Forestry impact potential is judged to be high between node U and Ore Creek and low-moderate elsewhere; the overall rating is judged to be moderate-high.

BRIDGE (F1X)SEGMENT - 19.7 KM

The Bridge (F1X) segment ascends the Thompson dry cool IDF zone of North Blackhill Creek valley, followed by the very dry cool MS, and the very dry cold ESSF zone at the elevational high of the Camelsfoot Range. From the Camelsfoot Range, segment F1X descends through the very dry cool MS and Thompson dry cool IDF to the Applespring Creek valley, and then through the Thompson very dry hot IDF to the Thompson very dry hot PP of the Bridge River valley and node X.

There is an existing logging road and evidence of harvesting activity in the Blackhill Creek drainage near node F1. No other existing forest tenures would be impacted.

Segment F1X would be a new route without existing transmission lines; overall vegetation impact potential is moderate-high, with sensitive, slow to revegetate and high erosion potential sites occurring in the steep terrain between Blackhill and Applespring creeks, and the high elevation very dry cold ESSF. Although the route is relatively densely forested, the rugged terrain and relatively low commercial timber values, suggest that the forest impact potential is low.

EAST PAVILION (WW1DE) - 11.8 KM

The East Pavilion (WW1DE) segment begins on the eastern Fraser plateau, north of Pavilion Creek, in the very dry warm IDF, and descends through the Thompson very dry hot IDF to the Thompson very dry hot PP of the Pavilion Creek valley. From Pavilion Creek, segment WW1DE traverses the Thompson very dry hot PP to node W1, and descends through the Thompson very dry hot PP to the Thompson very dry hot Bunchgrass (BG) of Fraser River valley bottom. Segment WW1DE then climbs through the Thompson very dry hot PP and Thompson very dry hot IDF, to the Thompson dry cool IDF at node E.

Dry sensitive sites which are slow to revegetate, and therefore have a high erosion potential, occur in the very dry hot PP and the very dry hot BG zones.

Segment WW1DE would be a new route which does not parallel any existing ROW; the vegetation impact potential is moderate-high. The forest impact potential is judged to be low between nodes W and W1; the remainder of the route from node D to E is virtually identical to that described for the Fraser (CDE) suboption which is also rated as having low forestry impact potential.

SOUTH PAVILION (W1F1) - 8.5 KM

The BEC zonation of South Pavilion (W1F1) segment is identical to the area between nodes W1 and D in the East Pavilion (WW1DE) segment discussed above. Segment W1F1 would be a new route which does not parallel any existing ROW. Dry sensitive sites which are slow to revegetate, and therefore have high erosion potential, occur in the very dry hot PP and the very dry hot BG zones.

The overall vegetation impact potential in segment W1F1 is moderate-high. The forestry impact potential is judged to be low.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton (G1G2) suboption of the Anderson (GH) segment lies within the Cascade dry cool IDF zone. The steep terrain with the resultant high soil erosion potential is the principal concern for revegetation.

Vegetation impact potential is rated as moderate for the Seton suboption.

Forestry impact potential should not exceed those on the section of segment GH located below, which is rated as low-moderate.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

The D'Arcy (H1H2) suboption lies within the undifferentiated IDF zone. It is a new route located east of the existing BC Hydro ROWs. The land traversed is primarily forested.

Overall vegetation impact potential is moderate. Suboption H1H2 is judged to have equal or lower forestry impact potential than those on the adjacent sections of segments GH and HJ which are low-moderate.

LOKLA SUBOPTION - 1.0 KM

The Lokla suboption, within the southern subcontinental IDF zone, is rated as having low-moderate vegetation impact potential. Because of its very short length and the low-moderate impact potential in the Gates (HJ) segment, the forestry impact potential is negligible.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

The Function (Y1Y) suboption, within the southern submaritime wetter CWH zone, is rated as having low-moderate vegetation impact potential. Considering the short sections of the 3 km suboption that are forested, the forestry impact potential is negligible.

CALLAGHAN (N1Y2) - 6.7 KM

The Callaghan (N1Y2) segment lies within the southern maritime wetter CWH zone. Segment N1Y2 passes through the Chart Area of FL A19216 of Canadian Pacific Forest Products. It also crosses some relatively high capability forest lands.

Segment N1Y2 is rated as having low-moderate vegetation impact potential. The forestry impact potential would not differ from those between nodes N1-N on segment MN which are rated as high.

HIGH CHEAKAMUS (YZT) - 36.6 KM

The High Cheakamus (YZT) segment lies within the southern submaritime wetter CWH from node Y to approximately Butterfly Lake. South of Butterfly Lake, it is within the Pacific Ranges drier maritime CWH. Segment YZT would be wholly on new ROW located on the undulating east slope of the Cheakamus River valley, primarily on land managed for forestry. Segment YZT crosses mature coniferous forests, second-growth, mixed (deciduous and coniferous) forests and recently logged areas. Mature coniferous forests are dominated by Douglas-fir and western hemlock, accompanied by lesser amounts of western and red cedar and pacific silver fir. Second growth stands are dominated by Douglas-fir, black cottonwood and red alder, site quality is poor.

The overall vegetation impact potential is low-moderate; forestry impact potential is roughly similar to that in the Upper and Lower Cheakamus segments, and is rated moderate.

PINECREST (Y1N2P1) - 21.6 KM

The Pinecrest (Y1N2P1) segment lies entirely within the wetter CWH and the southern drier CWH. The southern drier CWH is characteristic of the Cheakamus valley bottom south of McGuire.

The route is adjacent to existing transmission lines (2L1/2L2 and 5L42) for two-thirds of its length. There are no high impact potential vegetation values or significant limiting factors for revegetation and vegetation impact potential is low. The balance of the route runs along the undeveloped sideslopes of the Cheakamus Valley; there are no high impact potential vegetation values, and a moderate impact potential rating is assigned to this section.

For approximately the first 5 km south of node Y1 the route follows the 2L1/2L2 and Highway 99 corridor. Mature and immature stands of Douglas-fir and western hemlock occasionally accompanied by lodgepole pine are crossed. Forest quality is mostly poor, although a few small areas of non-productive brush also occur. This section of the route also passes near several plantations where the forestry impact potential is moderate. Most of the remainder of the route crosses steep, rocky terrain dominated by mixed stands of Douglas-fir, western hemlock, lodgepole pine and Pacific silver fir ranging in age from 60-100 years. Many of the stands were burned in a 1931 fire; site quality is mainly poor although some low quality areas occur. Approximately 5 ha of merchantable old growth (greater than 251 years) Douglas-fir/western hemlock and western hemlock/western red cedar, are located near the mouths of Callaghan and Brandywine creeks.

The overall vegetation impact potential for segment Y1N2P1 is judged to be low-moderate; forestry impact potential is judged to be moderate.

East Suboption

The east suboption (Y1YN2) is entirely within the southern maritime wetter CWH zone. For almost all of its 6 km length, the route follows existing ROWs. Immature stands of Douglas-fir, western hemlock, lodgepole pine and Pacific silver fir are encountered together with some cleared areas. Some mature merchantable stands dominated by western hemlock and Douglas-fir occur on the upslope side of the route, but these may not be impacted by use of the route. Site quality is poor-low. New ROW would be required for the last 2 km of the suboption; timber values are similar to those along the main route except for some mature and advanced immature stands of western hemlock near node Y3.

The overall vegetation and forestry impact potential of the east suboption is judged to be low.

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MAP SERIES III

Vegetation and Forestry

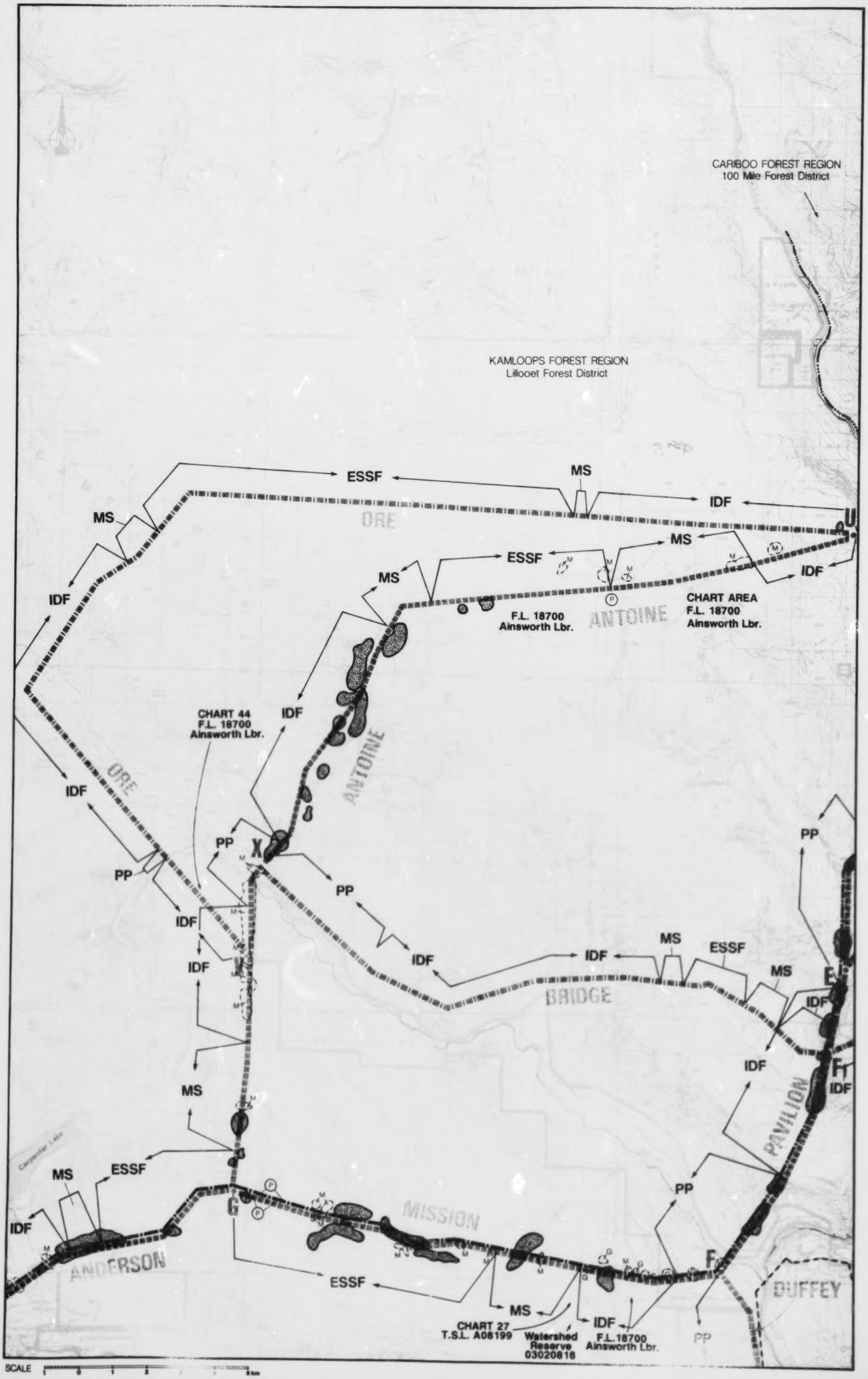
Camelsfoot	1 West
Fraser River	1 East
Bridge River	2
Cayoosh	3
Anderson	4 North
Duffey	4 South
Gates River	5
Pemberton Valley	6
Whistler	7
Cheakamus	8

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CAMELSFOOT

VEGETATION AND FORESTRY

III - 1 West



VEGETATION AND FORESTRY

Map Series III

LEGEND

TRANSMISSION SYSTEM

EXISTING

·+··+··+··	2L1 RoW - not utilized for 5L46
-------·	2L2
- - - - -	2L90 and 2L91
------	3L2
·········	5L41
—·—··	5L42

5L46 ROUTE ALTERNATIVES

▨	1989 NETWORK - Utilizing 2L1 RoW
▨	1989 NETWORK - Utilizing New RoW
▨	1989 NETWORK - Utilizing Existing Unoccupied RoW
▨	1990 ALTERNATIVES - Utilizing 2L1 RoW
▨	1990 ALTERNATIVES - Utilizing New RoW
•A	NETWORK NODE

FORESTRY

—···—	Forest Region Boundary
Ⓟ	Plantation
▩	Sensitive Site
▨	Mountain Pine Beetle - General area of historic or potential infestation

F.L.	Forest Licence	**T.S.**	Timber Sale
T.S.L.	Timber Supply Licence	**(T.F.P.)**	Terminal Forest Products
W.L.	Woodlot Licence	**(C.P.F.P.)**	Canadian Pacific Forest Products

SITE QUALITY

G	Good Site
M	Medium Site

VEGETATION

Biogeoclimatic Symbol	Biogeoclimatic Zone*
AT	Alpine Tundra
AT/MHp	Undifferentiated Alpine Tundra + Parkland Mountain Hemlock
AT/ESSFp	Undifferentiated Alpine Tundra + Parkland Engelmann Spruce - Subalpine Fir
BG	Bunchgrass
CWH	Coastal Western Hemlock
IDF	Interior Douglas-fir
MH	Mountain Hemlock
MHp	Parkland Mountain Hemlock
MS	Montane Spruce
ESSF	Engelmann Spruce - Subalpine Fir
ESSFp	Parkland Engelmann Spruce - Subalpine Fir
PP	Ponderosa Pine

* (Klinka, Green et al. 1984. Lloyd, Angrove et al. 1989)
Refer to resource descriptions by segment within the report for the specific biogeoclimatic subzone and variants

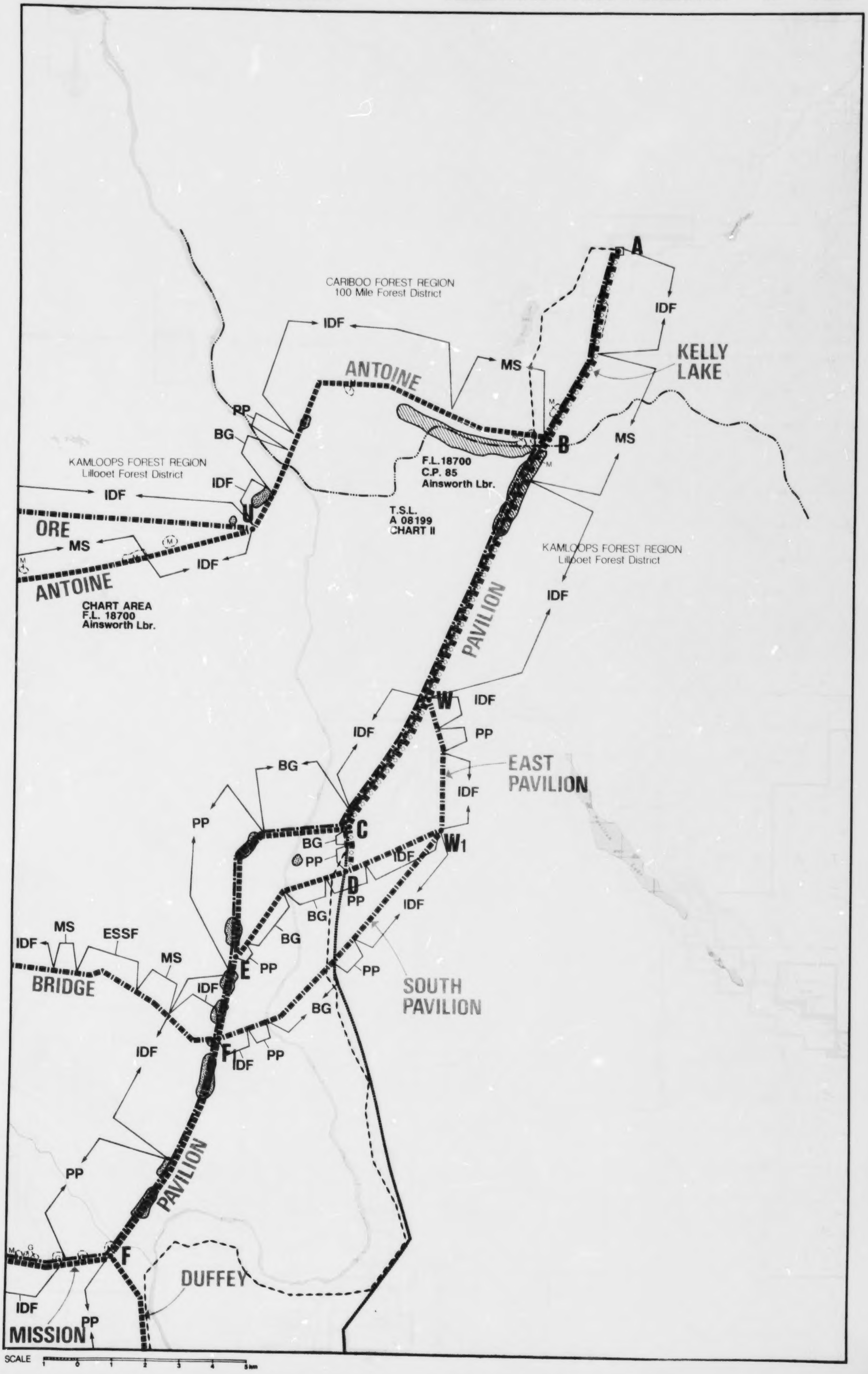
⩧	Wetland Vegetation
○	Sensitive High Elevation Vegetation (Alpine parkland and meadows, or steep, exposed slopes)

MAP SERIES III
LEGEND
(Foldout) →

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

FRASER RIVER

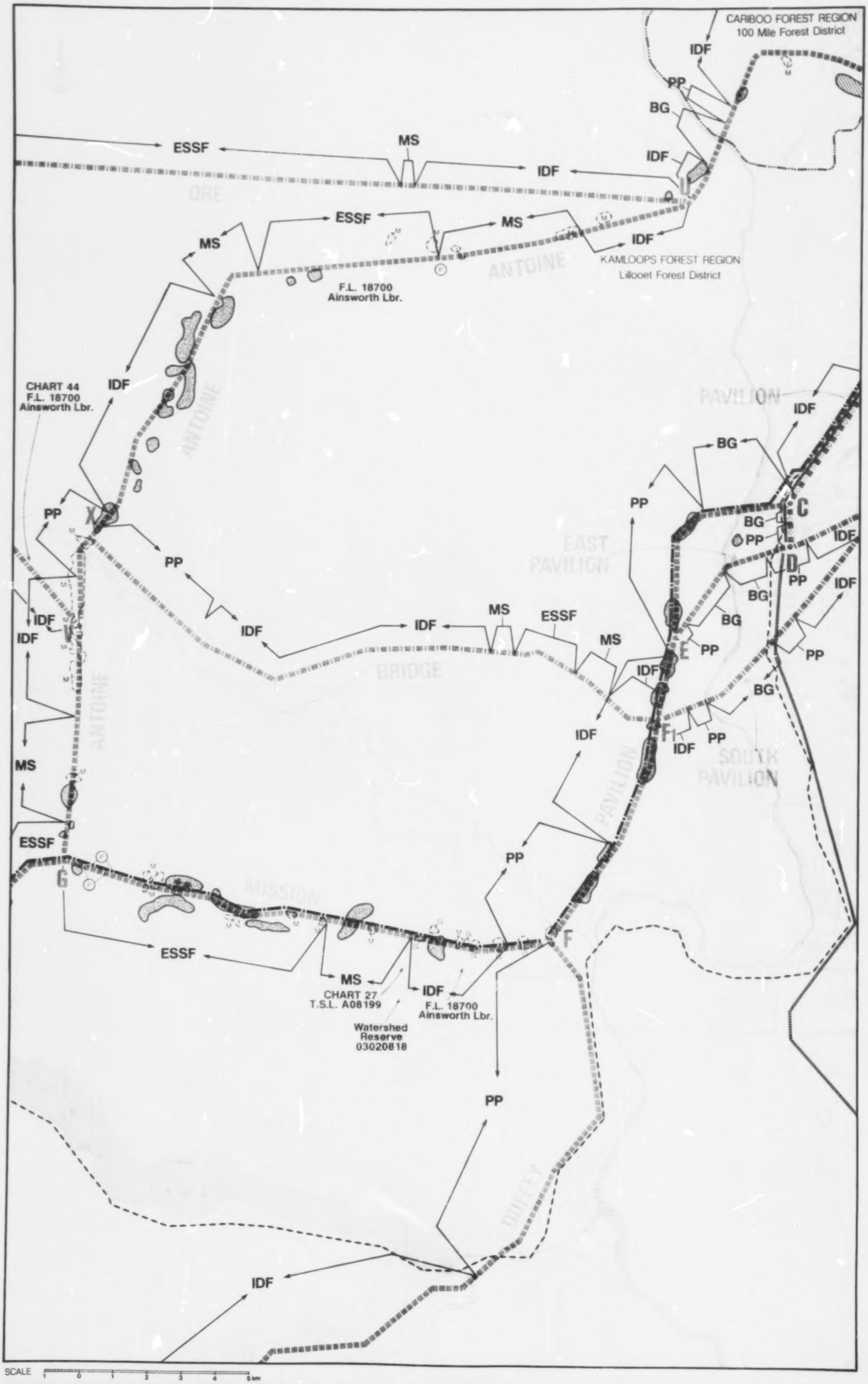
VEGETATION AND FORESTRY III – 1 East



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

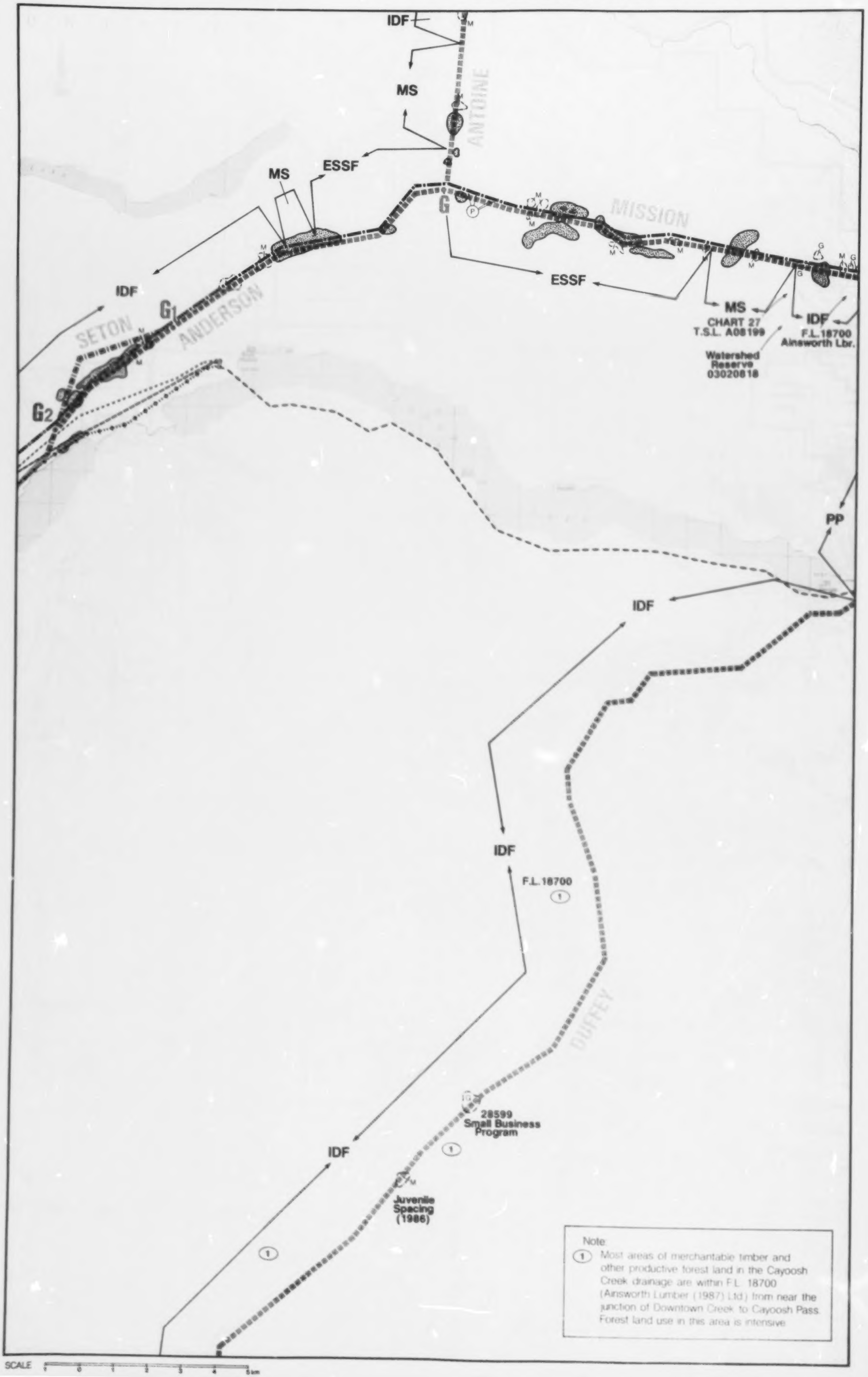
BRIDGE RIVER

VEGETATION AND FORESTRY III – 2



CAYOOSH

VEGETATION AND FORESTRY



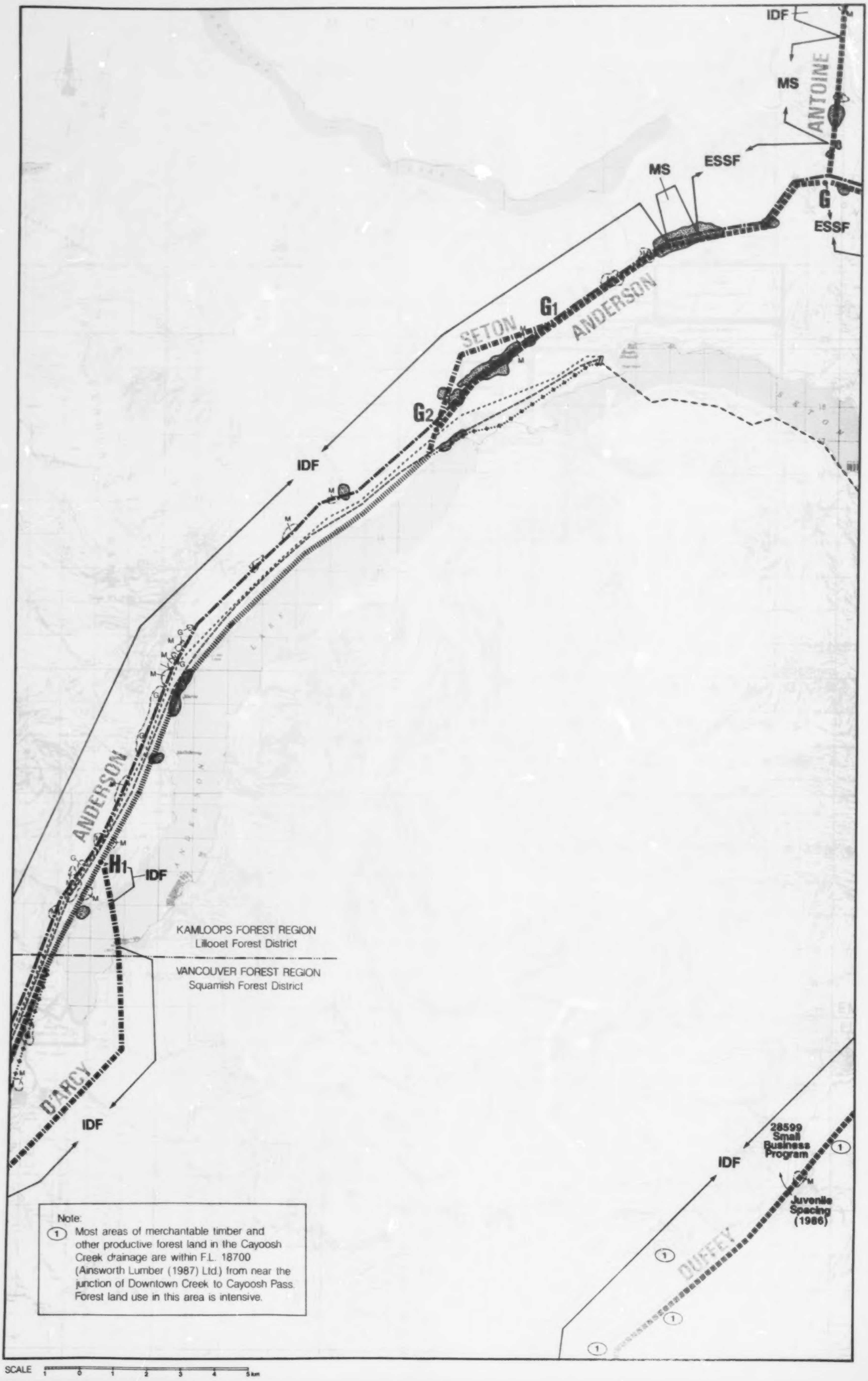
Note:

① Most areas of merchantable timber and other productive forest land in the Cayoosh Creek drainage are within F.L. 18700 (Ainsworth Lumber (1987) Ltd) from near the junction of Downtown Creek to Cayoosh Pass. Forest land use in this area is intensive.

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

ANDERSON

VEGETATION AND FORESTRY



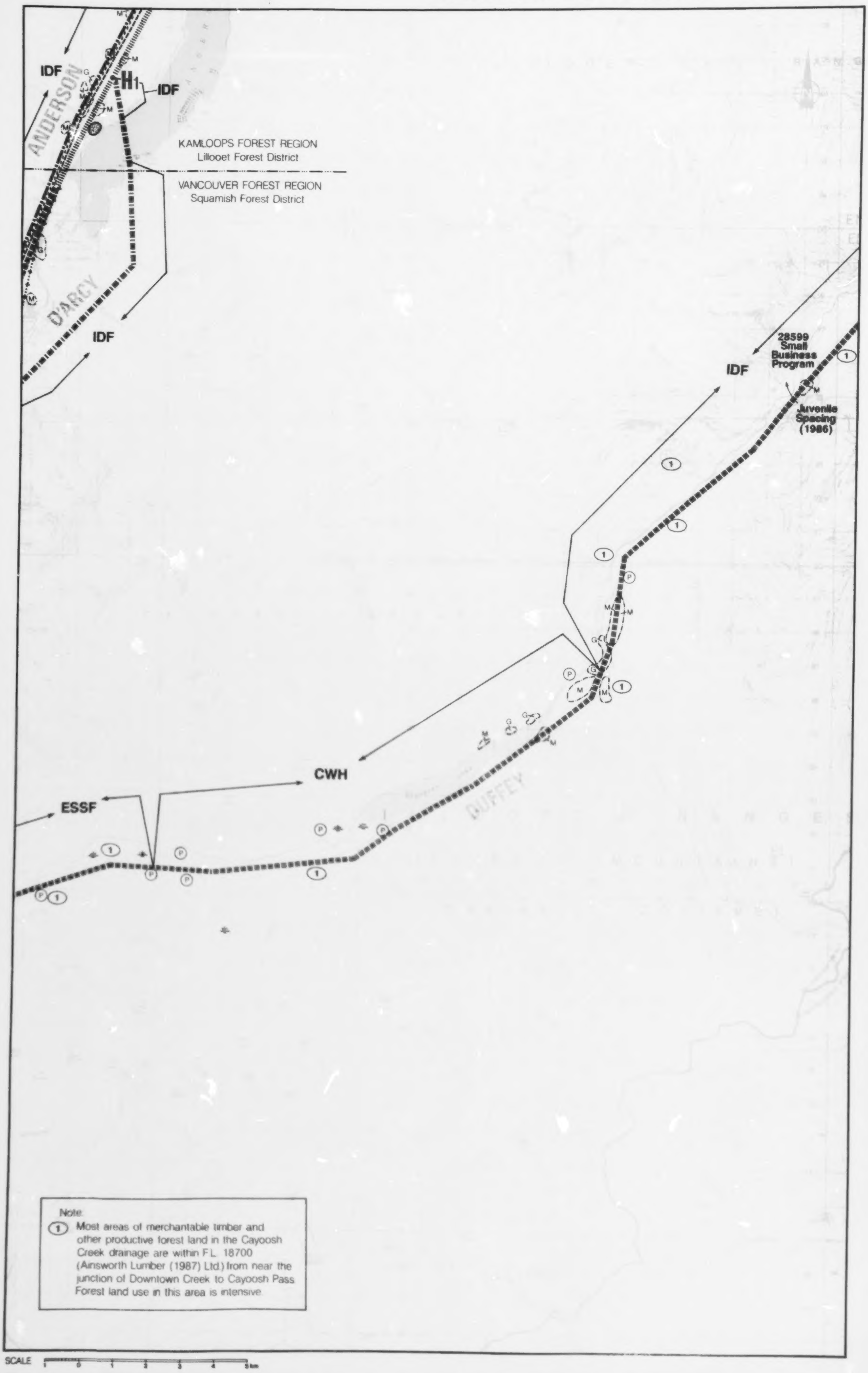
Note:

① Most areas of merchantable timber and other productive forest land in the Cayoosh Creek drainage are within F.L. 18700 (Ainsworth Lumber (1987) Ltd.) from near the junction of Downtown Creek to Cayoosh Pass. Forest land use in this area is intensive.

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

DUFFEY

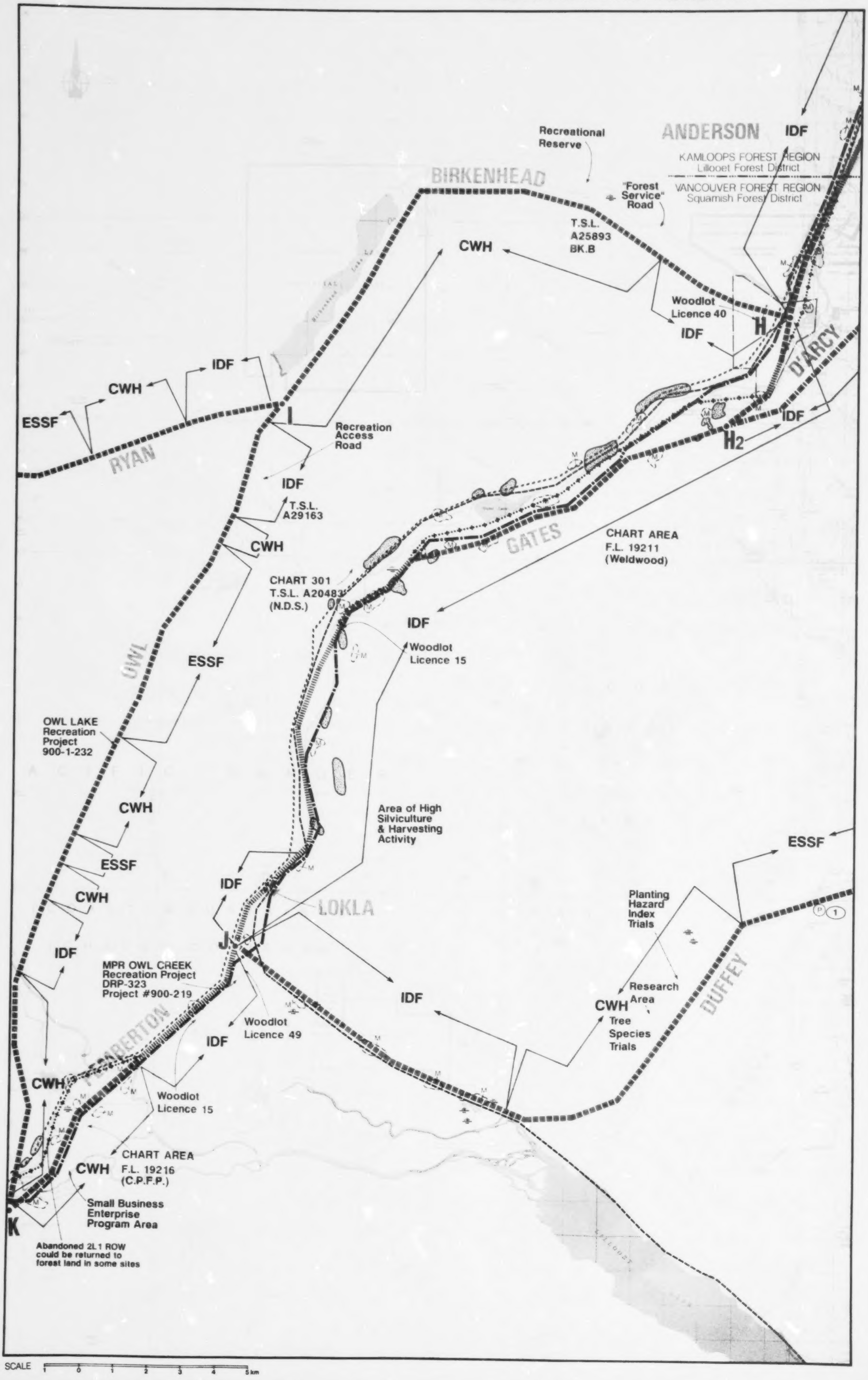
VEGETATION AND FORESTRY III – 4 South



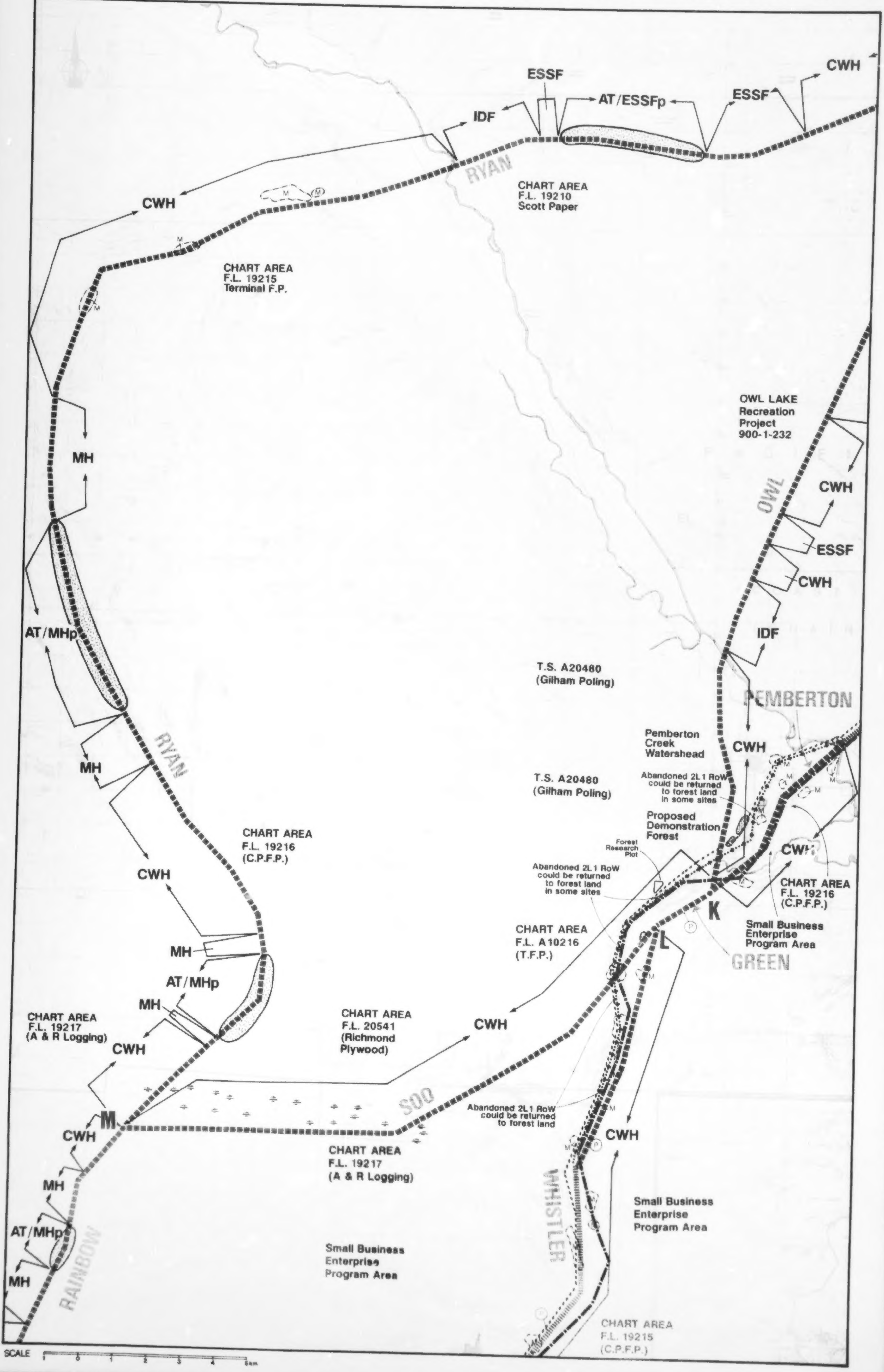
Note:
① Most areas of merchantable timber and other productive forest land in the Cayoosh Creek drainage are within F.L. 18700 (Ainsworth Lumber (1987) Ltd.) from near the junction of Downtown Creek to Cayoosh Pass. Forest land use in this area is intensive.

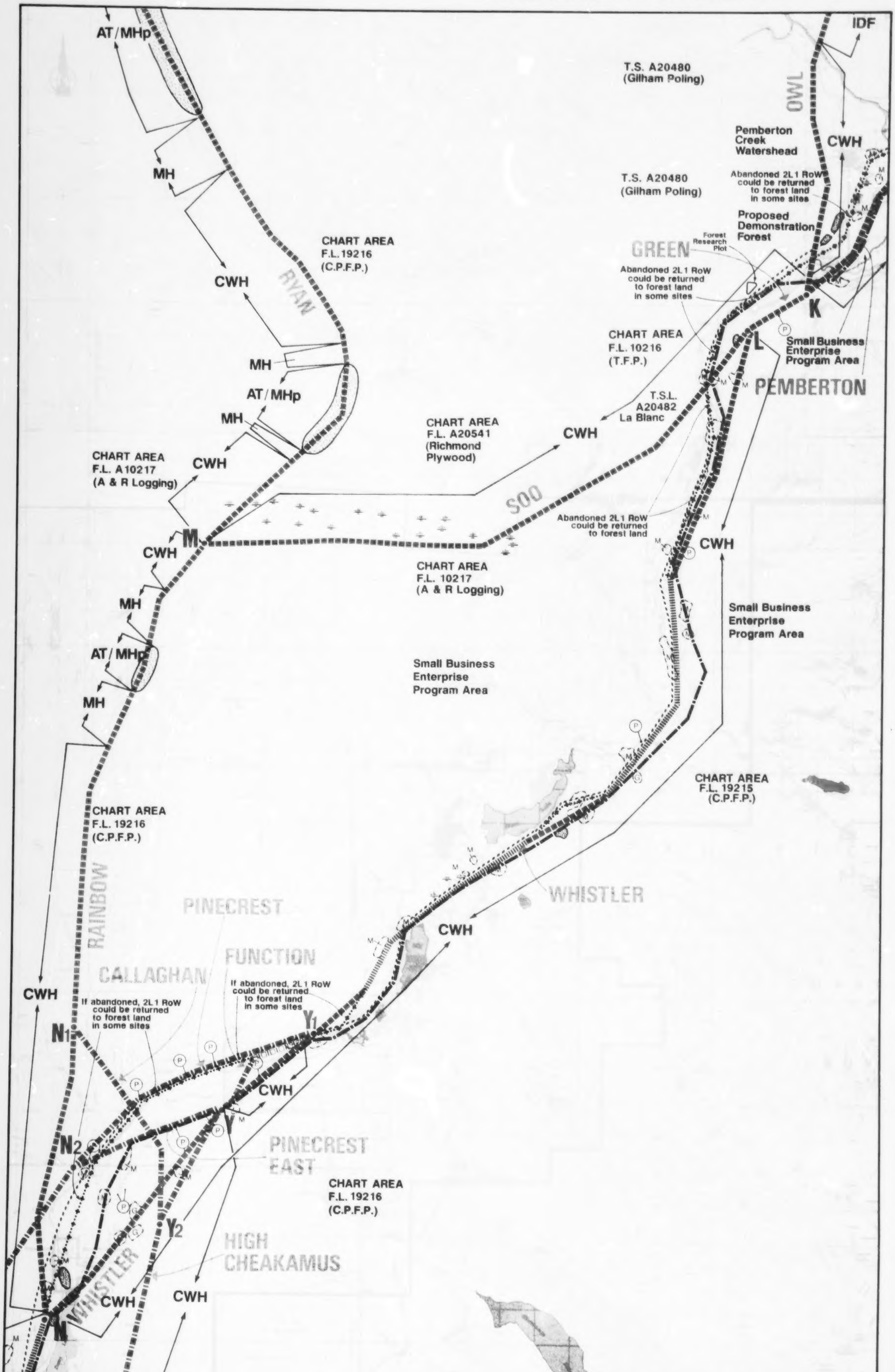
GATES RIVER

VEGETATION AND FORESTRY



PEMBERTON VALLEY




AT/MHp
IDF
T.S. A20480
(Gilham Poling)
OWL
Pemberton
Creek
Watershead
CWH
MH
T.S. A20480
(Gilham Poling)
Abandoned 2L1 RoW
could be returned
to forest land
in some sites
Proposed
Demonstration
Forest
CHART AREA
F.L. 19216
(C.P.F.P.)
GREEN
Forest
Research
Plot
Abandoned 2L1 RoW
could be returned
to forest land
in some sites
CWH
RYAN
K
CHART AREA
F.L. 10216
(T.F.P.)
L
Small Business
Enterprise
Program Area
MH
AT/MHp
PEMBERTON
T.S.L.
A20482
La Blanc
MH
CHART AREA
F.L. A20541
(Richmond
Plywood)
CWH
CHART AREA
F.L. A10217
(A & R Logging)
CWH
SOO
Abandoned 2L1 RoW
could be returned
to forest land
M
CWH
CWH
CHART AREA
F.L. 10217
(A & R Logging)
MH
Small Business
Enterprise
Program Area
AT/MHp
Small Business
Enterprise
Program Area
MH
CHART AREA
F.L. 19215
(C.P.F.P.)
CHART AREA
F.L. 19216
(C.P.F.P.)
RAINBOW
PINECREST
WHISTLER
CWH
FUNCTION
CALLAGHAN
CWH
If abandoned, 2L1 RoW
could be returned
to forest land
in some sites
If abandoned, 2L1 RoW
could be returned
to forest land
in some sites
N1
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Y
N2
PINECREST
EAST
CHART AREA
F.L. 19216
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Y2
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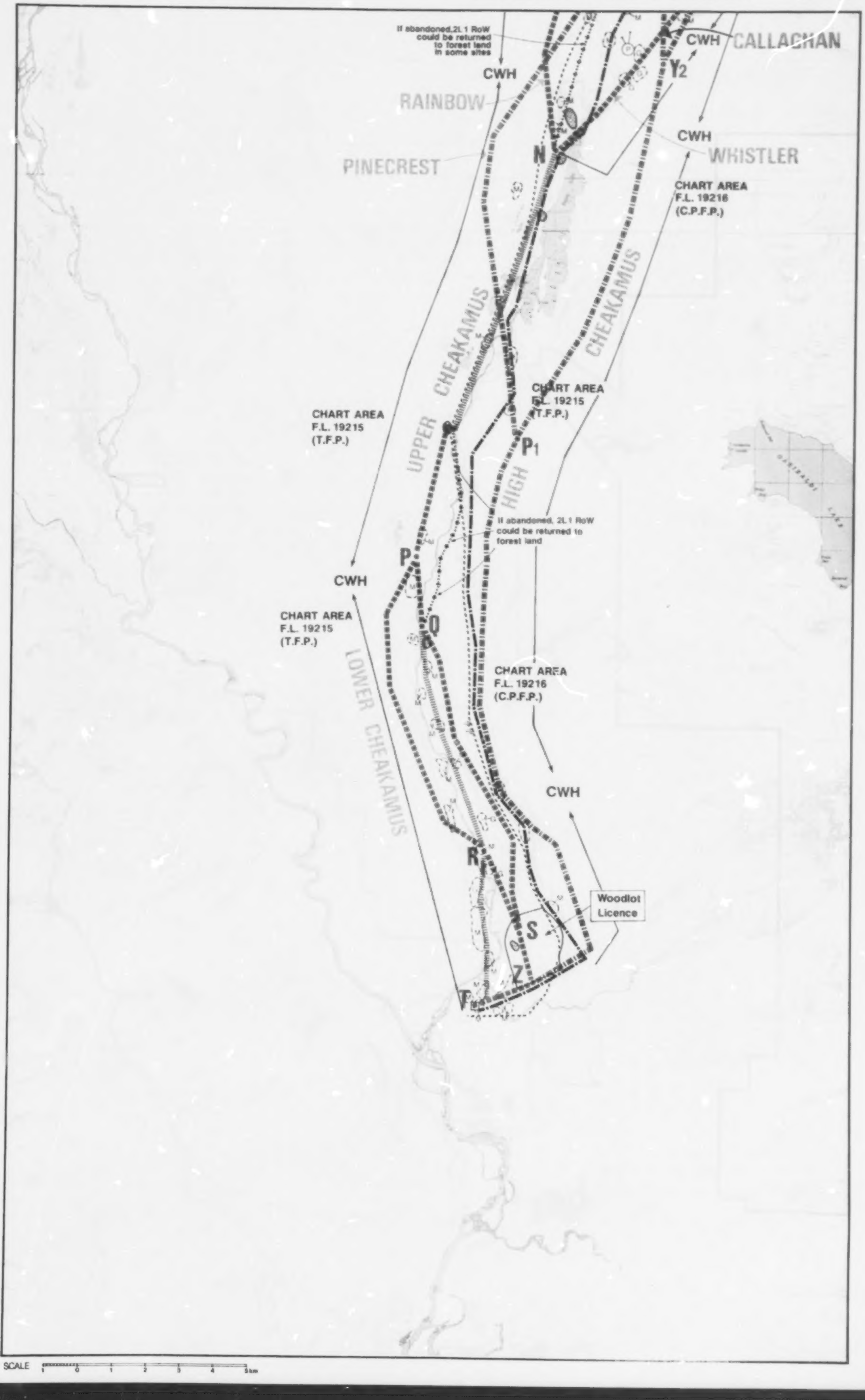
CHEAKAMUS

VEGETATION AND FORESTRY



IV
FISH AND WILDLIFE

WILDLIFE

Wildlife and habitat information is based on interviews with government personnel and local residents, and data obtained during aerial and ground reconnaissance surveys of the 1989 Network during the spring, summer and autumn of 1989. A helicopter overview of the 1990 Alternatives was made in June 1990.

The wildlife resources of the Study Area are influenced by climatic, biological, topographic and land use factors. For example, a wide diversity of wildlife habitats occurs within the Study Area as it extends from the Cariboo region through the dry Interior and Fraser River terraces across the rugged Coast Mountains into the wet maritime climate of the Squamish area.

Those wildlife species with known sensitivity to habitat change or disturbance, those with economic/recreational importance and rare or endangered wildlife species received the most attention during the course of this investigation. However, numerous other wildlife species also occur within the Study Area, and the construction, operation and maintenance of 5L46 would result in habitat changes and alteration of use patterns for several of the less obvious, but ecologically important, species such as perching birds, amphibians, reptiles and small mammals.

The identification of exact areas of importance to wildlife along the route segments is not possible as most wildlife species are highly mobile and occupy different habitat types seasonally. The lack of year-round reliable survey information for all species further compounds this problem. However, the annotated wildlife mapping contained in Map Series IV indicates the portions of the route alternatives known to provide important habitats for key wildlife species and species groups.

A partial species list of Study Area birds and mammals is given in the Resource Assessments Report (Talisman, 1990). Information presented on Map Series IV is based on a limited summer and early autumn field program (helicopter and ground surveys) aerial photographic interpretation of habitat types along the routes, published information (i.e. CLI information), MOE Wildlife Branch file information, site-specific data from informed residents of the study area and information provided by Wildlife Branch biologists in Kamloops (Region 3) and Surrey (Region 2) MOE regional offices.

Regional and Headquarters based non-game biologists of the MOE Wildlife Branch were contacted to obtain information on the occurrence of wildlife species in the Study Area that will be considered for designation (the "Red List") as endangered or threatened species by the Wildlife Branch (Harcombe, 1989). Of the 25 species of amphibians, reptiles, birds and mammals on the Red List, only the spotted owl could be potentially affected by the project (Dodd, pers. comm.). This seldom observed bird species is known to occur in the mature, coastal coniferous (old growth) forests of southwestern B.C. A single specimen was collected near Alta Lake in 1943 and the latest breeding record of the spotted owl was in 1963, when a nesting snag was felled about 60 km north of Squamish. One injured nestling was found at this time (Howie, 1980). Wildlife biologists and amateur ornithologists have recently searched for the spotted owl in the Soo Valley, Squamish watershed and Pemberton areas. However, these field searches were unsuccessful (Dunbar, pers. comm.). Preferred spotted owl habitat is old growth (230-600 yrs.) forests with multi-layered canopies (Forsman, Horn, Mines, 1985).

IMPACT POTENTIAL ASSESSMENT

The potential impacts of the clearing of forest cover and continued vegetation management along the routes on furbearers and trapping and guiding was assessed. However, existing use data was inadequate for an accurate assessment of furbearer and trapping or guiding industry impacts. It should be noted that BC Hydro has a trapline compensation program which has been acceptable to most trapline holders affected by similar transmission line projects elsewhere in the province, (Green, pers. comm.).

Past land use activities, most notably fire, transmission line clearing, road and railway construction, logging, agriculture and settlement, have strongly influenced the distribution of game and non-game species throughout the Study Area. The areas of known importance to wildlife along the routes are identified on Map Series IV and in the resource descriptions.

Where impact potential varies within a given route segment or suboption, the highest assessment is presented. The following assumptions were made:

- Habitat losses and changes resulting from clearing, road construction and vegetation management on new routes would have a greater impact on wildlife and trapping/ guiding industry than the construction of a transmission line on, or adjacent to, an existing ROW.

- Transmission line ROW clearing would result in the alteration of wildlife habitat; however, these changes are not always negative for all wildlife species. For example, additional edge habitat created by ROW clearing often provides good browse for deer and upland game bird habitat and areas with a greater diversity of food and cover plant species. These areas are generally more important to wildlife than those with a homogeneous vegetation type.

- Increased access to inaccessible wilderness areas would have long-term negative effects on most wildlife species (especially game species) primarily through population reductions due to increased legal and illegal hunting pressure.

For the purposes of this assessment the following wildlife impact potential ratings are defined:

- Negligible - 5L46 would not result in any discernible changes to wildlife habitats or existing wildlife use patterns, other than disturbances during construction (e.g. construction on an existing cleared ROW or on new ROW through areas where no clearing or new access is required such as open rangelands or other agricultural areas).

- Low - The impacts of 5L46 would not result in discernible changes to wildlife habitats or existing use patterns for more than the approximately one year clearing period, and from disturbances during construction (e.g. construction in sparsely vegetated subalpine and alpine areas using helicopter access only or on a new ROW adjacent to an existing cleared ROW where no new access roads are required).

- Moderate - 5L46 would alter wildlife habitat and/or wildlife use patterns for a 1-5 year period. These short and medium term impacts would result from ROW clearing and impacts resulting from the creation of access roads along the new ROW (e.g. construction across wetlands, limited clearing in riparian and forested habitats and limited new access; and removal of nest trees or preferred perching sites for raptorial birds) .

- High - 5L46 would alter wildlife for a period of more than five years, or permanently, resulting in displacement of wildlife or significant change in existing wildlife use patterns. These impacts could be either indirect or direct. Examples of direct impacts are: removal of critical food resources such as key browse plant species on ungulate winter range; complete filling or drainage of marsh, bog and swamp areas used by wetland wildlife; and removal of thermal and/or protective forest cover in poorly forested areas, and conversion of forest and riparian habitats to agricultural and grazing use. Examples of indirect impacts are: disturbance resulting from new access roads through remote areas and the resulting increases in hunting; and habitat damage caused by off-road vehicle use both on and off the ROW.

FISH

The watercourses crossed by the route alternatives lie within two major river drainages: the Fraser and the Squamish. Streams draining to the Fraser are crossed by the routes between Kelly Lake and Alpha Lake; streams in the Squamish drainage are crossed between Sproatt Creek and Cheekye.

Most streams and rivers in the Study Area support salmonids, stickleback and sculpins. The most important present are: salmon (sockeye, kokanee, coho, chinook, pink, and chum); trout (rainbow, steelhead, and cutthroat); char (Dolly Varden); and mountain whitefish.

Generalizations concerning the type of salmon and sport fish usage of streams crossed or paralleled by the routes are difficult to make. Between Nairn Falls and Daisy Lake and east of the Fraser, resident rainbow trout and Dolly Varden are the most important species. Lakes and large stream systems generally provide year-round feeding habitat; excellent to limited spawning and rearing habitat is found in the smaller tributaries.

In areas accessible to anadromous fish, usage varies with both species and sub-species occupancy. Species such as pink and chum salmon use the streams for upstream adult migration, spawning, egg incubation and downstream juvenile migration, while species such as chinook and coho salmon, steelhead and cutthroat trout usually use the streams for the same purposes as well as for juvenile rearing, which might last for a period of a year or more.

Variations in sub-species occupancy, such as with winter versus summer-run steelhead, or resident versus anadromous cutthroat trout and rainbow (steelhead) populations, usually produce changes in degree of stream usage during different life history stages. The larger river systems, such as the Fraser and Lillooet, support all salmon species, except chum, as well as rainbow and steelhead, Dolly Varden and mountain whitefish populations. Many smaller systems, having relatively low discharges, and many tributaries to larger streams are important for coho, trout and mountain whitefish production.

Fish production in the Study Area contributes to freshwater and saltwater sport fisheries, the commercial fishery and Native food fishery. The importance of the fish resources is reflected by the large-scale spawning channel construction and smaller-scale enhancement projects which have taken place on several streams within the Study Area.

BENTHIC FAUNA

Study Area benthic fauna have not been studied extensively. It provides an important food supply for resident fish resources, and is composed of aquatic insects, which spend their entire life cycle in the streams. For example: the true bugs and beetles and other insects which spend only the larval or nymph stages in the streams such as stoneflies, mayflies, true flies and caddisflies.

The aquatic insects utilize gravel/cobble substrate in faster flowing riffle areas and silt and sand substrate in slower moving pool areas. Riffle areas principally support clinging organisms, such as the caddisflies and true flies, while the pools support burrowing organisms, such as the true bugs and beetles. In general, all benthic invertebrates are sensitive to excessive sedimentation.

ANADROMOUS FISH

The Kelly Lake/Bridge River region includes two important salmon spawning areas: the lower Seton and lower Bridge rivers. The Fraser River, a major salmon migration route, also lies within this region. The lower Seton is the major spawning river in the region with escapements of up to 390,000 fish. Spawning takes place in the lower Seton in two spawning channels operated by Fisheries and Oceans Canada, and in the lower reaches of Cayoosh Creek. The Seton River is also an important salmon migration route. A fish ladder enables fish passage over the Seton River dam.

The Seton/Anderson lake system and its tributaries, such as Gates River, support large populations of sockeye, as well as coho, chinook and pink salmon. Major spawning areas in this system are the Seton River at Seton Portage, Gates River and spawning channel. Seton Lake is an important rearing area for the sockeye salmon stock that spawn in Gates River and spawning channel and Portage Creek. Most of the fry from Gates Creek migrate through Anderson Lake and rear in Seton Lake.

The Bridge River run can consist of as many as 40,000 fish, most of which spawn below the confluence of the Bridge and Yalakom rivers: with the intermittent flows over the Terzaghi Dam, the spawning areas immediately downstream are usually dry. The dam is impassable to upward fish migration.

The Birkenhead River, a tributary of Lillooet Lake, supports a major run of sockeye and small runs of coho and chinook salmon. Coho salmon migrate at least as far as Poole Creek and spawn along its length. The upper Lillooet River is utilized by spawning chinook and coho salmon. Escapement data indicate that coho runs can be as high as 15,000.

The lower reaches of both Pemberton Creek and the Green River are important spawning areas, mainly for coho salmon. A small run of sockeye is also associated with the Green River. Waterfalls prevent fish migration to upper sections of both streams.

The lower reaches of the Cheakamus River support coho and chinook salmon and steelhead trout. A narrow canyon approximately 14.5 km upstream from its confluence with the Squamish River prevents upstream migration by all anadromous fish. Tributaries to the Cheakamus (e.g. Cheekye River) are used by salmon; access is usually restricted to the lower reaches of the tributaries. Most of the rearing of juveniles takes place in the lower Cheakamus and Squamish rivers. Fisheries and Oceans Canada operates a salmonid hatchery on Tenderfoot Creek, a side channel of the Cheakamus north of the Cheekye; this hatchery produces coho and chinook salmon and steelhead trout.

SPORT FISHING

Sport fisheries in the Kelly Lake/Seton Lake region are highly productive, and are of major significance in a regional context. Kelly Lake has been stocked with rainbow trout in order to support local recreational demand. The Bridge, Yalakom and Seton rivers support Dolly Varden, mountain whitefish, rainbow and steelhead trout. The most productive sport fishing areas are at the confluences of the Bridge and Seton rivers with the Fraser River.

The Seton/Anderson Lake system is a productive, varied sport fishing area of major importance. Rainbow trout, Dolly Varden, char and mountain whitefish are fished in both the lakes and tributaries. Gates Lake supports kokanee salmon and, in Gates River, a steelhead fishery was created as a result of the MOE Fisheries Branch stocking program. Birkenhead River and Lake are known for their rainbow trout and Dolly Varden. In addition to these, chinook salmon and steelhead trout are fished in the river.

In the Pemberton/Cheekye region, high fishing pressure occurs as a result of the close proximity of the region to the populated Lower Mainland area, and the development of Whistler. In the Green River, rainbow trout and Dolly Varden are the most common catches, and steelhead are occasionally taken below Nairn Falls. Green, Alta, Nita and Alpha Lakes support Dolly Varden, rainbow trout and kokanee, and are stocked by the Fisheries Branch.

Callaghan Lake, at the headwaters of Callaghan Creek, offers some of the best natural stock fishing in the Cheakamus drainage. The primary species present are large rainbow trout and Dolly Varden. Callaghan Creek has a low sport fishing potential, as it has a steep gradient and low habitat diversity.

Daisy Lake offers reasonable rainbow trout fishing, but the Cheakamus River between Daisy Lake and the Cheakamus Canyon does not provide good catches. Below the canyon, anadromous fish become available, primarily coho and chinook salmon, as well as steelhead and cutthroat trout. The steelhead fishery in the Cheakamus is important accounting for 500 catches annually.

NATIVE FOOD FISHERIES

Important Native food fisheries are located on the Fraser, Bridge and Seton (Portage Creek) rivers. Overall, the Fraser is most significant and areas at the confluence of the Seton and Bridge rivers are particularly important. The fishery at Portage Creek (Seton Portage) is of minor importance when compared to these other two areas. Another major Native food fishery is located at the head of Lillooet Lake and on the Birkenhead and Lillooet rivers; the catch consists of coho, chinook and sockeye salmon.

METHODOLOGY

Aquatic environmental assessment work in the Study Area began in 1982 by Hatfield Consultants Limited. Documentation was prepared relative to the routes being considered at that time. The work involved a review of surface drainage data published by the Water Survey of Canada (1980), water quality data compiled by Environment Canada (Inland Waters Directorate), and information on benthic fauna and fish resources. Fish resource information for streams along the route alternatives were derived from MOE Fisheries Branch and Fisheries and Oceans Canada records. Salmon escapement figures, sport fishing and Native food fishing data were included in the review. Field reconnaissance was carried out in September 1982 to examine biophysical features at each accessible stream crossing along the routes.

For the 1989 Network assessment, previous documentation and data sources were reviewed and updated where possible, and fishery agency personnel were contacted at Fisheries and Oceans Canada offices in Squamish and Kamloops, and at MOE Fisheries Branch offices in Kamloops and Surrey. Reconnaissance work was carried out by using a helicopter along the Duffey, Pemberton, Birkenhead, Owl, Ryan, Green, Soo, Whistler, Rainbow, and Upper and Lower Cheakamus segments; and by ground truthing inspections of each stream crossed by the Duffey, Pemberton, Birkenhead, Green, Soo, Whistler, and Upper and Lower Cheakamus segments. Data from 1982 reconnaissance work was referred to for the Pavilion, Mission, Anderson and Gates segments and the 1990 Alternatives: Ore, Bridge, East and South Pavilion, Callaghan, High Cheakamus, and Pinecrest segments; and the Seton, D'Arcy, Lokla, Function, and Pinecrest East suboptions.

IMPACT POTENTIAL ASSESSMENT

To assess fisheries impact potential, each of the routes were compared according to the following criteria:

- The number of streams crossed (the fewer the better).
- The relative importance of the aquatic habitat near a route; preferred crossings or parallel alignments would be located away from important spawning, rearing and over-wintering areas.
- The distance between a route and a parallel waterbody; a reasonably wide separation between a waterbody and a route is preferred to minimize the loss of riparian vegetation and, thereby, sediment levels in runoff, and to avoid increasing accessibility.
- The location of a route relative to 2L1; the use of the ROW is generally preferred because it minimizes the amount of new clearing and confines construction and maintenance activities to an existing ROW.

1989 NETWORK

KELLY LAKE (AB) - 6.0 km

Wildlife

The Kelly Lake (AB) segment is characterized for most of its length by coniferous forest habitat on the north facing slope of Pavilion Mountain. The ungulate (mule deer and moose) capability for this route is classified by the CLI as Class 3. The initial 1-2 km crosses more diverse forested and cleared habitat types of the Kelly Creek valley. This lowland area appears to have a slightly higher capability for ungulates and is reported to be commonly used by deer and some moose.

The overall wildlife impact potential in segment AB is moderate.

Fish

There are six stream crossings in segment AB, four of which are of minor importance as they lie in upper drainage areas where flows are very low and fish use is unlikely. Two crossings, one of Kelly Creek and one of a nearby tributary, are sited where important salmonid species are present and habitat values are high.

Segment AB is adjacent to existing transmission lines, thereby limiting fisheries impact potential to low, short-term effects.

PAVILION (BCEF) - 29.3 km

Wildlife

The Pavilion (BCEF) segment is adjacent to the existing transmission lines through the Diamond S Ranch and Pavilion IR 1. Deer occur throughout segment BCEF, and moose have been reported to the east in the Marble Range and on the ranch. Bighorn sheep are occasionally observed in small herds along the east bank of the Fraser River near the 5L42 crossing and south past the alternate crossing in the vicinity of Tiffin Creek (suboption CDE).

West of the Fraser, segment BCEF is adjacent to and crosses the southern portion of the Camelsfoot Range which is used by mule deer.

The wildlife impact potential in segment BCEF adjacent to 5L42 with some further clearing along the route is assessed as moderate; and the impact potential in suboption CDE is also moderate.

Fish

In segment BCEF the BC and EF sections together cross eight streams, the CE section crosses six and the Fraser (CDE) suboption crosses four. Fisheries values in Gillon Creek (two crossings) and Slok Creek pertain to small numbers of salmonids dispersed along the mainstems. The Fraser and Bridge rivers have high fisheries values, but steep valley walls at each crossing would enable construction activities to occur well away from instream resources. Pavilion Creek is not likely to contain important fish populations.

Segment BCEF is adjacent to existing transmission lines for its full length. Of fourteen stream crossings, six are located where important fish populations and habitat are present.

Low, short-term impacts would be expected at five crossings; no impacts are expected at the Fraser River.

Comparing section CD with suboption CDE, important considerations are:

OPTION	# OF CROSSINGS	IMPORTANT CROSSINGS	POTENTIAL IMPACTS
Section CE	6	Fraser River	Nil: Terrain features help avoid impacts.
		Slok Creek (adjacent to existing ROW).	Low, short-term
Suboption CDE	4	Fraser River	Nil: Terrain features help avoid impacts.
		Pavilion Creek	Nil: Terrain features help avoid impacts.

Suboption CDE, therefore, appears to present lower fisheries potential impacts than section CE; ROW development across Slok Creek on suboption CDE would not be expected to result in significant negative effects on fish resources in Slok Creek due to its incised channel.

ANTOINE (BG) - 44.3 km

Wildlife

The Antoine (BG) segment, which was identified in previous studies as having very high environmental impact potential has been re-examined. Additional information on the wildlife resources of the area has been obtained from MOE Wildlife Branch staff, field observations provided by Mr. Doug Sheriff, resident of the Antoine Creek area, and two helicopter surveys conducted during the summer and early autumn of 1989. These interviews, site-specific use information, wildlife sightings, and recent project field work confirm the importance of segment BG to a variety of wildlife species.

Long-term wildlife survey data and use information along certain portions of segment BG are incomplete or completely lacking. For example, wildlife use information and inventory data for the Camelsfoot Range, especially the area from Slok Hill to the Fraser, is limited. However, the Antoine Creek valley and adjacent uplands are known to be of importance to several species of wildlife. This part of segment BG is relatively inaccessible and undisturbed as access via logging roads or transmission lines does not exist along Antoine Creek between Slok Hill and Bridge River.

The grassland and open forest habitats along the east side of the Fraser from Moran to Cavanagh Creek are very important spring/summer and winter range for deer and about one hundred California bighorn sheep (Low, pers. comm.). Bighorn sheep habitats along terraces and breaks east of the Fraser near Moran are actively managed and enhanced by Regional MOE Wildlife Branch personnel. Recent MOE survey results indicate that past (1982 and 1989) prescribed spring burning of grassland areas used as winter range by bighorn sheep has served to increase the quality of the bighorn sheep range and maintain a high population in the area from Pavilion to High Bar IR 2. Wildlife Branch staff have radio-collared bighorn sheep in the High Bar area during late 1989 to obtain data on sheep movements and habitat utilization in this area (Holman, pers. comm.).

The provision of road and ATV access into the area along the route would undoubtedly result in a degradation of excellent quality sheep and deer habitat and would also result in an increase in the presently low levels of hunting in the area. Several California bighorn sheep have been reported to move seasonally from summer use areas in the Marble Range to winter ranges on the Edge Hills adjacent to the Fraser (Holman, pers. comm.). This movement corridor is intersected by one and perhaps two sections of the segment BG between Node B and the Fraser River. Regional Wildlife Branch staff (Kamloops) do not favour the location of 5L46 in this portion of the route for these reasons. It is anticipated that the potential wildlife impacts of the 5L46 through this portion of segment BG would be high.

Much of the area along segment BG west of the Fraser to the head of McKay Creek near Slok Hill (Camelsfoot Range) has been logged. Recent logging done in response to a mountain pine beetle outbreak has significantly increased road access in the area. Ungulates known to occur along this section of the route include deer which are found on the bank and terraces above the Fraser and elsewhere throughout the logged area, and moose which occasionally move into the area from the Leon Creek valley to the north. This area is often used by both deer and moose hunters, especially native food hunters (MacDonald, pers. comm.).

The wildlife resources of the inaccessible Antoine Creek section of the route between Slok Hill and the Bridge River have been documented by Mr. Doug Sheriff, a resident of the Antoine Creek valley. Mr. Sheriff has observed and mapped wildlife information in the Antoine Creek, Mt. Duncan and Slok Hill area since 1987; the information has been provided to the MOE Wildlife Branch (Kamloops). The Antoine Creek valley and adjacent forested habitats provide important furbearer habitat (Kier, pers. comm.), and Mr. Sheriff has reported fisher, a furbearer which requires relatively continuous coniferous forest cover in the Antoine Creek valley. Bighorn sheep have been observed during the winters of 1987/88 and 1988/89 on the lower and mid-slopes of Mt. Duncan, adjacent to Antoine Creek, and also in an area near the route (pers.comm. Sheriff). Mr. Sheriff and MOE Wildlife Branch Regional Habitat staff also have identified a mountain goat valley crossing site on Antoine Creek approximately 5 km upstream of the Bridge River confluence. A mountain goat rutting area and kidding area used from April to early June has also been identified by Mr. Sheriff along the east side of Antoine Creek less than 1 km from the route. The apparent low value of merchantable timber in Antoine Creek combined with the difficult terrain conditions in the valley will probably preclude any future logging, and hence construction of logging roads. If there is no increase in access beyond the present road, the valley would probably continue to provide protection to its existing populations of deer, bighorn sheep and mountain goat.

Segment BG crosses excellent year-round mule deer habitat and winter range on the lower slopes of Mt. Bishop, near Moha and on both sides of the Bridge River. South of the Bridge River, the route rises on Mission Ridge and would provide an additional ATV and road access to the north side of Mission Ridge, which might result in increased hunting pressure and disturbance of the mountain goat populations known to occupy the steep bluffs along the south side of the Bridge River between Terzaghi Dam and Moha.

A high number of wildlife impacts are anticipated along segment BG because the route crosses several high use/capability wildlife areas, particularly east of the Fraser and from Slok Hill to Bridge River Valley (i.e. Antoine Creek valley and Bridge River valley). The wildlife impact potential from increased access, habitat disturbance and disruption of traditional movement corridors and reproductive sites along segment BG is assessed as high and are among the most severe in the Study Area.

Fish

Sixteen stream crossings occur in segment BG of which eleven are significant in terms of potential effects on fisheries values. Streams crossed include the Fraser River, Cavanagh Creek (which is crossed twice), Antoine Creek and the Bridge River. Segment BG also lies along the mainstems of Cavanagh and Antoine creeks.

No corridors presently exist along segment BG, therefore, new ROW clearing would be required. In addition, terrain conditions would create difficulties for construction activities which would be expected to result in erosion and siltation impacts at each crossing and along mainstem sections closely paralleling the route, unless very specific mitigative measures could be developed and effectively implemented. At the Fraser crossing, fisheries values are high but terrain conditions (e.g., steep, unforested valley walls) would enable construction to occur without fisheries impacts.

The overall fisheries impact potential in segment BG is assessed as moderate.

MISSION (FG) - 15.0 km

Wildlife

The Mission (FG) segment runs adjacent to 5L42 up and along Mission Ridge. Mountain goats occur on Mt. McLean and Mission Ridge. Clearing and access road upgrading for 5L46 could cause some additional disturbance to fragile subalpine habitats used by mountain goat at the highest portion of the route.

The overall wildlife impact potential of 5L46 in segment FG is low.

Fish

Three of seven small streams crossed by segment FG potentially are important in relation to known valuable salmonid habitat in the Bridge River system downstream of the crossing sites.

Because segment FG follows an existing corridor, fisheries impact potential is low and short-term.

DUFFEY (FJ) - 89.0 km

Wildlife

The Duffey (FJ) segment, extending from Lillooet through Cayoosh Canyon and over the Cascade divide to Creekside Capacitor Station near Mount Currie, contains some of the most diverse wildlife habitat found in the Study Area. Wildlife use is high and viewing opportunities abound along the scenic Duffey Lake Road. For example, mountain goat, deer, grizzly bear, black bear and furbearers occur in the Cayoosh Creek/Duffey Lake valley. In addition, a variety of bird species also inhabit the varied dry interior, subalpine and valley wetland habitats crossed by segment FJ.

The distribution of deer, mountain goat, grizzly and black bear are shown on Map Series IV. Mountain goat occur along most of the route with excellent viewing opportunities adjacent to the Duffey Lake Road in the Cayoosh Creek Canyon and along the north side of Cayoosh Creek to Duffey Lake. Guided (L. Ouellet, guide/outfitter) and unguided limited entry mountain goat hunting is done in the Cayoosh Range directly upslope of the route. Grizzly bear are also relatively common in this area and are often observed in the subalpine and alpine zones and the avalanche tracks leading to the Cayoosh Creek valley, and in the vicinity of Duffey Lake. Grizzly bears are hunted in spring along both sides of segment FJ from Cayoosh Canyon to Duffey Lake.

Segment FJ crosses part of a CLI Class 3W deer winter range located immediately east of Cayoosh Creek (Holman, pers. comm.). Deer, upland game birds, and furbearers are common throughout the forested, lower slope and riparian habitats crossed by the route. A mountain goat movement corridor which would be crossed by segment FJ has been identified between Van Horlick Creek, which flows north into Duffey Lake and the subalpine mountain goat habitats north-west of Duffey Lake (Holman, pers. comm.).

The area crossed by segment FJ which lies north and east of Mount Currie is used by native hunters. Deer, furbearers and black bear are harvested on IRs 6 and 7. Black bear and deer are also hunted elsewhere along the route especially from Joffre Creek to Creekside (Rande, pers. comm.). Waterfowl, including migratory waterfowl (ducks, geese and swans) utilize the head of Lillooet Lake and Xit'olacaw Lake situated adjacent to the route on the Mt. Currie IR 6.

Overall wildlife impact potential is assessed as high for segment FJ.

Fish
Segment FJ would involve thirty-six stream crossings, of which fifteen involve important instream resources. Seton River, Birkenhead River and Cayoosh Creek are the largest systems crossed. The Seton and Birkenhead rivers support important salmon runs, as well as other salmonids. The lower Seton River is the major spawning area in the region with escapements of up to 390,000 fish. Spawning occurs in two channels and in the lower reaches of Cayoosh Creek. Salmon also migrate up the Seton River via a fish ladder over the Seton Dam.

Cayoosh Creek would be crossed four times and important salmonid habitat is present at each one. The route closely parallels Cayoosh Creek for much of its length, and nine tributaries, including Gott, Blowdown, Van Horlick, Caspar, and Cerise creeks and four unnamed streams are crossed within several hundred metres of Cayoosh Creek, where important salmonid habitat is present. The route runs within 600 m of Duffey Lake, and crosses Van Horlick Creek approximately 800 m upstream of the lake. Duffey Lake supports important populations of Dolly Varden and rainbow trout. The Birkenhead River, which is crossed near Node J, is an important salmonid system.

None of the crossings of important streams are located on, or adjacent to, existing ROW crossings. New ROW clearing would increase potential fisheries impacts. Furthermore, the aligning of the route parallel to the Cayoosh mainstem throughout its length could contribute to cumulative impacts along its length. At the Seton River crossing, which involves an unforested valley and a high valley wall on the north side of the Seton River, impact potential is negligible.

The overall fisheries impact potential in segment FJ is assessed as low-moderate and short term.

ANDERSON (GH) - 39.5 km

Wildlife
The steep rugged terrain at the summit of Mission Ridge near node G is used by mountain goat and the 5L42 ROW north of Shalalth is used by black bear and deer. These species also use the existing transmission line clearings along Anderson Lake, where they are regularly hunted. Grizzly bear and mountain goat also have been observed in the subalpine and alpine areas near McGillivray and Connel creeks. These high elevation habitats are well above the route and should not be affected by line construction or maintenance.

The wildlife impact potential of 5L46 when using the 2L1 ROW along Anderson Lake is expected to be negligible, other than disturbance during construction. The potential impact could be low-moderate in certain areas along Anderson Lake if ROW widening results in the loss of narrow strips of vegetative security cover which are important to deer.

The overall wildlife impact potential in segment GH is assessed as negligible-low.

Fish
Streams in segment GH are characterized by steep gradients, fast flows and large material substrates. Thirteen streams are crossed. McGillivray and Connel creeks support trout species in sections upstream of the route. Whitecap Creek supports important salmonid species throughout its length; it is tributary to Seton River (Portage Creek), which lies downstream of the route and is a major salmonid system with salmon spawning areas near the confluence.

Segment GH follows an existing corridor, and existing crossings would be used at nine streams excluding Whitecap Creek which would be crossed in a deep gully. Limited clearing would be required and impacts would be expected to be low and short-term.

BIRKENHEAD (HI) - 20.0 km

Wildlife
The Birkenhead (HI) segment runs along north facing slopes, south of Blackwater Creek, then passes east of Birkenhead Lake to node I situated near the confluence of Taillefer Creek and Birkenhead River. Wildlife values are not high along the Blackwater Creek section (node H to Birkenhead Lake) as the route cuts through forest and over recent cut-blocks situated on north facing slopes and avoids valley wetlands. The route passes through a known mountain goat use area east of Birkenhead Lake, where the mountain goats are protected in the Provincial Park and a healthy population remains.

Even though visual and wildlife viewing impacts of segment HI could be significant, the overall impact potential from the construction and operation of 5L46 on wildlife is assessed to be moderate, as the route crosses the mountain goat range at a low elevation, in an area which currently is not commonly used by mountain goats (Blood, pers. comm.).

Fish
Eight stream crossings occur along segment HI. Blackwater Creek, crossed near its confluence with Gates River, supports important salmon, trout and char populations. Its crossing is located in an open agricultural area, which would reduce ROW clearing and minimize effects. The route parallels Birkenhead Lake for 6 km, at a distance of 700 m. Important populations of kokanee, rainbow trout, Dolly Varden, char and mountain whitefish are present.

Low, short-term impacts would be expected in the Blackwater Creek area. Four Birkenhead Lake tributaries are crossed, none of which support major species; low flows would limit potential effects on Birkenhead Lake.

GATES (HJ) - 27.5 KM

Wildlife
The route in the Gates (HJ) segment is located within the narrow Gates River valley for approximately 14 km, then continues south within the Birkenhead River valley for another 14 km to node J. The MOE Wildlife Branch boundary between Regions 2 and 3 crosses segment HJ south of Birken. Although detailed wildlife survey data are not available for this area, black bear and deer are commonly observed in the Gates and Birkenhead river valleys. Moose and a limited number of mountain goat also are reported to occur in valley bottoms and lower slope habitats. Ungulate habitats along the route from node H to Birken are CLI Class 4 for deer and moose. The route traverses some better capability ungulate habitat (CLI class 3 deer winter range) from Spetch Creek to the southern end of the segment, node J. This area is also important for upland game birds and furbearers, and is used by native hunters, espe-

cially the lowland and lower slopes along the existing transmission lines from Birken to Creekside.

Furbearer and ungulate habitat alteration could occur caused by clearing and potential increased access to good quality deer winter range between Spetch Creek and Creekside. Impacts are expected to be low where the 2L1 ROW is utilized (roughly half of the segment length in the Birkenhead River valley and 2 km of the Gates River valley, south of D'Arcy).

Wildlife impact potential for segment HJ is assessed to be moderate.

Fish
In segment HJ, new ROW clearing would be required at six stream crossings between node H and Poole Creek. Existing crossings (seven) would be used from Poole Creek to node J. Blackwater Creek carries runs of coho salmon and rainbow and cutthroat trout, Dolly Varden may also be present. Gates River supports sockeye, coho and pink salmon, kokanee, rainbow and steelhead trout, Dolly Varden, and mountain whitefish. There is a sockeye spawning channel on the creek at D'Arcy. Sockeye and kokanee use spawning habitat near the outlet of Gates Lake which contains kokanee, Dolly Varden and rainbow trout. Rainbow trout would be expected in Seven Mile, Eight Mile and Place creeks in sections near Gates River, downstream of the ROW crossing.

The Birkenhead River, a tributary of the Lillooet River, supports a major run of sockeye and small runs of coho and chinook salmon, and steelhead trout. Coho salmon migrate at least as far as Poole Creek to spawn. There is a chinook and steelhead fishery. Birkenhead River is known for its rainbow trout and Dolly Varden char.

The major impact potential is siltation of the Gates River from erosion on new ROW paralleling Gates River. If controlled by proper clearing and revegetation, impacts would be low and short term.

OWL (IK) - 25.0 km

Wildlife
The route within the Owl (IK) segment crosses the Birkenhead River valley east of Taillefer Creek, climbs through subalpine and alpine habitats in the headwaters of Fowl Creek, passes through the upper reaches of Owl Creek, descends to and crosses the Lillooet River valley, and joins the existing transmission line corridor south of Pemberton.

Segment IK has no transmission line ROW and very few other access roads at present. Moose have been reported in the Birkenhead River valley near node I, and black bear are common throughout the area. Mountain goat have also been observed in the subalpine and alpine areas between Fowl and Owl creeks. The route crosses good year-round deer habitat and CLI Class 3W deer winter range located on the lower, south facing slopes between Owl Creek and the Lillooet River.

In segment IK, the overall wildlife impact potential is moderate; habitat disturbance and the opening-up of fragile subalpine and alpine areas to off-road vehicles could result in erosion and vegetation impacts and the reduction in wildlife viewing potential.

Fish
Eight streams are crossed in segment IK, including three in the Birkenhead River system, two in Owl Creek system, and one crossing each of Lillooet River, Pemberton Creek and Green River. Salmon runs and trout populations occur at the Lillooet River crossing, and trout and char species are expected at Green and Birkenhead rivers, two Birkenhead tributaries (Fowl Creek and an unnamed stream), Owl Creek, an unnamed tributary draining a headwater lake, and Pemberton Creek.

The route would require new ROW clearing and low level, short-term impacts would be expected at each crossing.

RYAN (IM) - 57.0 km

Wildlife
The Ryan (IM) segment starts near Birkenhead Lake crossing forested, subalpine and alpine habitats between Mt. Ronayne and Seven O'Clock Mountain. The route descends to the Lillooet River valley through important deer winter and spring range on the north side of the valley some 20 km northwest of Pemberton. The route rises up Ryan River and a tributary adjacent to, and through, areas of known importance to mountain goat. The MOE Wildlife Branch estimate that the mountain goat population in the upper Ryan and Wasp Creek area is approximately 85 animals (Forbes, pers. comm.) based on helicopter and ground surveys in 1989. This area, and the upper parts of the Miller Creek drainage are also known to be important to grizzly bear. The route crosses a high alpine ridge at the divide between Ryan and Rutherford creeks, it then descends the Rutherford Creek valley before rising over another alpine ridge to drop down into the Soo River valley. Mountain goats are also frequently observed in the subalpine and forested portions of upper Rutherford Creek.

Segment IM ranks next to the Duffey (FJ) and Antoine (BG) segments in terms of wildlife significance: its features include high mountain goat populations, fragile habitats, undisturbed grizzly bear use areas and excellent wildlife viewing opportunities. As the route traverses the western end of the Soo wetlands (refer to segment LM), an additional moderate impact on wetland habitats is anticipated as is an increase in the potential for bird collisions with transmission lines which cross the wetland area.

The wildlife impact potential in segment LM is assessed as high.

Fish
Nineteen stream crossings occur along segment IM, fourteen of which feature important fishery values. Birkenhead River, Taillefer Creek and Lillooet River support important salmon and trout populations. Tenas Creek, crossed twice, supports rainbow trout. The Birkenhead, Taillefer and lower Tenas crossings are all within a few hundred metres of their confluence. Trout and Dolly Varden char habitat is present in Ryan and Rutherford creeks and the Soo River. Wasp Creek is crossed within 300 m of Ryan River. Ryan River is crossed in two places, and two headwater streams are crossed. Two Rutherford tributaries are crossed in steep terrain.

A new ROW would be required and terrain and precipitation (snow) conditions would create construction difficulties. Impacts would be expected from erosion and siltation at Ryan Creek where the route lies adjacent to the flood plain, and at two tributaries upstream. Two tributaries of Rutherford Creek also lie in steep terrain.

Site specific mitigative measures would need to be developed and successfully implemented to limit effects to low level, short-term impactts in segment IM.

PEMBERTON (JK) - 10.0 km

Wildlife
The Pemberton (JK) segment would utilize the 2L1 ROW from Creekside to the Lillooet River and then follow 5L42 to node K. 2L1 crosses good deer winter range between Owl Creek and the Lillooet River. The productive agricultural lands of the Pemberton Valley also support nesting waterfowl, raptorial birds and passerine birds. The valley is also of known importance to migratory waterbirds including ducks, Canada geese and trumpeter swans.

As segment JK uses an existing ROW through the deer winter range and is adjacent to 5L42 across the Pemberton Valley, wildlife impact potential is expected to be low.

Fish
Four of five streams crossed in segment JK contain important fisheries resources. Salmon species (chinook, coho and sockeye) are distributed among the Lillooet and Green rivers and Pemberton Creek, and trout species and Dolly Varden char would be expected at, or near, the Owl Creek crossing. Dikes along the Lillooet and Pemberton rivers would serve to separate ROW construction activities from habitat and fish resources.

The crossings along segment JK all lie within an existing corridor, and impact potential on fisheries values would be minimized to low level, short-term effects.

GREEN (KL) - 2.0 km

Wildlife
Site-specific wildlife information is limited for the Green (KL) segment on the lower slopes of Mount Currie, east of Green River

near Tisdall. However, it is probably used by deer, black bear and several other non-game species.

As habitat of this type is not in short supply in the Study Area and because use of the area by deer would likely increase as a result of line clearing, the wildlife impact potential of 5L46 in segment KL is judged to be negligible.

Fish

No streams are crossed in segment KL; there are no potential fisheries impacts.

SOO (LM) - 18.0 km

Wildlife

The Soo (LM) segment is characterized by deer and moose habitats. Large areas of the Soo valley have been logged since the 1980-83 field investigations and large clear cuts are common along both sides of the Soo River wetlands, an interconnected 7 km long complex of marsh and floodplain vegetation, on both sides of the Soo River, about 6 km west of Highway 99. These wetlands are the most extensive marsh habitat types within the study area and are considered to be locally and regionally important by wildlife managers (Carlson and Trethewey, pers. comm.).

Wetland wildlife, particularly nesting waterfowl (diving and dabbling duck and Canada goose), beaver and several species of shorebirds and other waterbirds use the Soo wetlands. Moose utilize the wetlands for feeding in the summer months and blue grouse and deer are also commonly observed feeding in adjacent logged uplands. The eastern end of the wetlands is crossed by the route. However, as the route for most of its length is located south of the Soo River and upslope of the marsh complex, impacts on wildlife should be low. Wetlands should be avoided if possible, and existing hydrological conditions in the marsh and riparian habitat types should not be disturbed.

The overall wildlife impact potential in segment LM is assessed as moderate-high.

Fish

Eight streams are crossed in segment LM, of which three - the Green and Soo rivers and a Soo tributary - support important salmonid populations. The Soo tributary is crossed in an area where it flows within the Soo floodplain, and is collinear with the ROW for approximately 2 km.

A new ROW would be required and low level, short-term impacts would be expected.

WHISTLER (LN) - 37.0 km

Wildlife

The Whistler (LN) segment is not expected to cause any major wildlife habitat changes, and if properly planned and carefully constructed, should not alter wildlife viewing opportunities to any extent. Those wildlife species of most viewing interest (deer, black bear, great blue heron, waterfowl-ducks, geese and swans - osprey, bald eagle and a variety of perching birds) using Green and Alta lakes and the wetland areas between them should not be further adversely affected by 5L46. A small wetland area also occurs along Miller Creek which supports beaver and other wetland species.

The wetland area between Green and Alta lakes is a relatively unusual wildlife habitat type in the Whistler area and is important as a migratory bird stop-over and as wetland habitat. The marsh/riparian vegetation and open water portions of this wetland should be protected, according to biologists of the Canadian Wildlife Service (Retfalvi and Trethewey, pers. comm.). Local residents interested in wetland habitat enhancement, photography and wildlife viewing also share this opinion. Although the wetland has been modified by past land-use practices, and is traversed by the existing transmission lines, it was found to be well used by wildlife during the August 1989 field surveys. Part of this marsh area and riparian habitats adjacent to the ROW are being considered for golf course development.

Measures should be taken so that long-term wetland hydrology would not be altered by the project. However, moderate, short-term changes to marsh vegetation and drainage would be expected where temporary road access to tower foundations is required. These impacts could be reduced by removing temporary access road material from wetland areas, and scheduling pile driving for foundations and tower construction activities during a period of the year when wildlife activity in the marsh is low (i.e. late fall or winter). Construction plans and scheduling of any work in the Whistler wetlands should be approved by Regional Wildlife Branch Habitat Protection staff (Carlson, pers. comm.).

The potential for birds, especially swans and great blue herons colliding with transmission lines exists in the Whistler wetland area and elsewhere along the Kelly Lake to Cheekye corridor; this does not appear to be a problem between Green and Alta lakes (Trethewey and Eakins, pers. comm.) and should not be for 5L46 as it would be in the centre of three lines crossing the wetlands.

Wildlife impact potential in segment LN is assessed as low-moderate, assuming that adverse impacts on the wetland between Green and Alta lakes can be avoided.

Fish

Segment LN involves eleven crossings of nine streams that feature important fisheries values; six crossings lie at, or adjacent to, existing stream crossings. Major streams crossed include Green River, Alta Creek (River of Golden Dreams), Miller Creek and Cheakamus River. Miller Creek and Cheakamus River are crossed twice. Important species present include rainbow trout, Dolly Varden char and kokanee salmon.

The sections using the existing corridor would require limited ROW clearing and construction effects would result in low level, short-term impacts. The two Cheakamus River crossings would require new ROW clearing and construction. The upper crossing is in an area of steep terrain, fast flows and limited use by fish and the lower crossing is in a ravine.

Appropriate mitigative measures would limit construction effects to short-term low level impacts.

RAINBOW (MN) - 23.0 km

Wildlife

The Rainbow (MN) segment runs through a relatively narrow pass west of Rainbow Mountain to join 2L1 south of Brandywine Provincial Park. Road access exists in most of the southern half of the route from the Callaghan Lake Road and several other mining/logging roads in the area, but there is no road through the pass or on its northern side.

Black bear and, occasionally grizzly bear, utilize the area, and deer are also frequently observed in the summer months. Grizzly and black bear have been observed in the Whistler area; two grizzly bears were removed from the Whistler garbage dump during the summer of 1989 (Rande, pers. comm). The Callaghan Lake area is also used by deer hunters and represents one of the closest good hunting spots for Vancouver-based hunters. However, the ungulate winter use of segment MN appears to be limited by snow depth. The southern 4 km of the route near Brandywine is reported to be of greater importance to deer, especially in the early spring (Carlson, pers. comm.).

The wildlife impact potential in segment MN is assessed as moderate.

Fish

Segment MN would involve ten stream crossings, five of which are located in areas of important instream values for rainbow trout and Dolly Varden char. The key crossings would include one on Brandywine Creek, and four in the Callaghan Creek system, including three on the mainstem.

ROW clearing would be required and construction effects would be expected to include low level, short-term impacts in segment MN.

UPPER CHEAKAMUS (NP) - 12.8 km

Wildlife

The Upper Cheakamus segment (NP) would use the 2L1 ROW from Daisy Lake to the Cheakamus Canyon, a new ROW would be used through the canyon. Deer are common throughout the area, especially in the floodplain of the Cheakamus River and adjacent uplands on both sides of the river.

The wildlife impact potential of the construction and operation of 5L46 through segment NP is expected to be low.

Fish
Segment NP crosses one stream and the north end of Daisy Lake. Important instream resources are present at Daisy Lake and the crossing of Chance Creek. The Daisy Lake crossing would span the lake, using high ground away from the lake shore. Chance Creek would utilize an existing crossing.

Impact potential at both crossings would be low level and short-term.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

Wildlife
The main wildlife species of concern within this portion in the Lower Cheakamus (PQRT) segment are deer and bald eagles. Large numbers of bald eagles congregate in winter to feed on salmon carcases downstream of the Cheakamus canyon; they would only be affected if perching trees along the river are cut: the 2L1 ROW is set back from the river, but two new crossings may be required.

From a wildlife impact perspective, the east (QS) suboption is preferable as it is located near existing developments (railway, transmission line and Highway 99), and avoids potential conflicts with productive lowland deer habitats and eagles feeding on spawned-out salmon in the Cheakamus River floodplain.

The south suboption (RST) is considered to be a favourable section for many of the same reasons, but would require clearing of a new ROW through a mature cottonwood stand south of node R, which may be a perching area for eagles. Segment PQRT should not cause any major wildlife impacts, as it utilizes the 2L1 ROW for most of its length.

Floodplain habitats impacts would likely be limited to construction phase. Wildlife impact potential of any of the route alternatives - PR, PQRT, QS, and RST - is expected to be low.

Fish
Route options in segment PQRT involve various stream crossing alternatives in the Cheakamus River system including the Cheakamus and Cheekye rivers, and Culliton and Swift creeks. The Cheakamus is an important salmonid system, providing spawning and rearing habitat for important populations of chinook and coho salmon and steelhead trout. Chum salmon also spawn in the river. Young salmonids are present in rearing habitat in the lower sections of Culliton and Swift creeks and the Cheekye River, but are not expected to occur at the various crossing sites. The Tenderfoot Hatchery is avoided by all route alternatives.

Construction impacts along segment PQRT, which follows an existing line and good roadway along the floodplain, would be expected to be very low, and short-term. The PR suboption crosses the Cheakamus at an important habitat area, but appropriate mitigation would limit effects. However, suboption PR along the west valley wall, as well as suboption QS along the east valley wall, could encounter terrain and soil conditions which, with high precipitation events, could result in erosion and sediment transport to the Cheakamus River.

Mitigative measures developed specifically for the area could be required to limit effects to short-term, low level impacts.

1990 ALTERNATIVES

ORE (UV) SEGMENT - 38.0 KM

Wildlife
The Ore (UV) segment traverses the Camelsfoot Range from node U to the top of the Ore Creek drainage west of Mt. Birch; much of this region is currently accessible along logging roads. This Camelsfoot section of segment UV crosses CLI class 3 and 4 lands for both moose and deer and the area is also reported to be used by bighorn sheep. The section of segment UV between Mt. Birch and the Yalakom River (the Ore Creek drainage) crosses good capability (mainly class 3) mountain goat, deer and bighorn sheep habitat. Most of the remaining sections of the route across the Yalakom River and south to node V across from Moha is of known importance as deer winter range (CLI class 3W).

The construction of 5L46, particularly in the Ore Creek portions of segment UV, would result in a marked increase in access to year-round deer, moose, bighorn sheep and mountain goat habitat. Segment UV also could be of importance to other species such as grizzly bear, black bear, furbearers and birds (information on use or habitat capability for these species was unavailable). Use of segment UV for 5L46 would result in a significant increase in access to the area and could result in an increase in big-game hunting.

The wildlife impact potential in segment UV is assessed as high, and similar in magnitude to those impacts described for the Antoine (BG) segment.

Fish
Segment UV crosses two tributaries of Leon Creek and it runs parallel to the Yalakom and Bridge rivers for 10 km, crossing three tributaries and the Bridge River (LaRochelle, Doe and Buck Creeks) within 1 km of their respective confluences.

The potential exists for cumulative impacts (sedimentation) to occur along the Yalakom and Bridge Rivers, but by effecting specific mitigative precautions, impacts would be limited to low level, short-term effects.

BRIDGE (F1X) SEGMENT - 19.7 KM

Wildlife
The Bridge (F1X) segment traverses high capability (class 3W and 4) ungulate habitats along its entire route. Segment F1X is relatively inaccessible compared with other segments of the route network and has important deer and mountain goat winter range.

The wildlife impact potential on segment F1X is assessed as high, particularly if road access was developed to the ROW in the Bridge River valley.

Fish
Segment F1X involves crossings of Antoine and Applespring creeks where they are deeply incised.

Fisheries impact potential in segment F1X is judged to be low and short-term.

EAST PAVILION (WW1DE) SEGMENT - 11.8 KM

Wildlife
The territory traversed by the East Pavilion segment (WW1DE) is CLI Class 4 for deer. Regional Wildlife Branch staff report that bighorn sheep also occur on the terraces and steep terrain east of the Fraser in the vicinity of both segments WW1DE and W1F1. Information on other wildlife resources in segment WW1DE is limited (although a grizzly bear was observed near node W1 on the June helicopter reconnaissance). West of the Fraser, segment WW1DE crosses CLI Class 4 mule deer habitat.

The wildlife impact potential of segment WW1DE is assessed as moderate.

Fish
The Fraser River crossing on segment WW1DE is not expected to affect fish populations. Segment WW1DE crosses the Pavilion Creek system in an agricultural area, where stream channel manipulation and low flows caused by irrigation withdrawals likely limit habitat capability.

Fisheries impact potential from ROW development in segment WW1DE would be low level and short-term.

SOUTH PAVILION (W1F1) SEGMENT - 8.5 KM

Wildlife
The South Pavilion (W1F1) segment traverses land with good capability for both deer and bighorn sheep. The wildlife resources described for the other Pavilion segments and the Fraser River (CDE) suboption are expected to occur along the segment W1F1.

The wildlife impact potential for segment W1F1 is assessed as moderate.

Fish
The Fraser River crossing on segment W1F1 would have no impact on fisheries.

SETON (G1G2) SUBOPTION - 5.5 KM

Wildlife
No wildlife survey data exists for the steep terrain of the Seton (G1G2) suboption. However, the area is classified as containing CLI Class 5 and some Class 3W (winter range) for both deer and mountain goat; and probably it is used by black bear and several other game and non-game wildlife species.

Based on the limited available information and observations made on the helicopter reconnaissance, the wildlife impact potential on the Seton suboption is assessed as low-moderate, which is higher than the corresponding section of the Anderson (GH) segment because of the need for a new ROW and access road.

Fish
The Seton suboption crosses Whitecap Creek and two streams that flow into Seton Lake, within a few hundred metres of the original crossings; Whitecap Creek is in a deep ravine so that no fisheries impacts are anticipated and fish values in the two streams are low.

The fisheries impact potential in suboption G1G2 is low and short term.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

Wildlife
The D'Arcy (H1H2) suboption traverses CLI Class 4 deer habitat and some Class 3W (winter range) for deer and mountain goat east of Devine. Habitats on lower slopes near the south end of Anderson Lake are expected to be utilized year-round by deer; wildlife data in the D'Arcy suboption area is very limited.

The wildlife impact potential on the D'Arcy suboption is assessed as moderate as new ROW would be required and direct and indirect impacts on deer, black bear and other wildlife species could be expected.

Fish
The D'Arcy suboption would require new ROW clearing for virtually all of its length except over Anderson Lake. The route would involve side-hill construction at five streams that flow into Gates River, three of which are expected to support rainbow trout populations.

Low level, short-term construction impacts would be expected at each crossing; potential cumulative effects on Gates River would involve low level, short-term increases in suspended solids.

LOKLA SUBOPTION - 1.0 KM

Wildlife
No information other than CLI ungulate capability mapping was available in the vicinity of the Lokla suboption; the very short diversion around the east side of Lokla IR 4 is not expected to alter the moderate wildlife impact potential assessment made for the entire Gates (HJ) segment, and the rating for the short suboption is negligible-low.

Fish
The Lokla suboption would not involve any difference in fisheries resource impacts compared with the adjacent segment HJ section which is assessed as low and short term.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

Wildlife
The Function (Y1Y) suboption of the Whistler (LN) segment uses the 2L1 ROW for approximately half of its 3 km length; the remaining half crosses the highway/railway corridor and gravel pits south of Whistler Village. Use of the suboption would avoid the need for the placement of a tower in the small Miller Creek wetlands.

The wildlife impact potential associated with the Function suboption is anticipated to be negligible-low because much of the wildlife habitat within the suboption is already in a disturbed state.

Fish
The Function suboption crosses Miller Creek and the Cheakamus River near their confluence, approximately 1 km downstream of the crossings. Also crossed is a small Miller Creek tributary of little significance to fish resources. Fish resource values are similar for both the suboption and Y1Y segment LN routes. The Function suboption would require new clearing at Miller Creek and the Cheakamus River crossing.

The fisheries impact potential would be low and short-term.

CALLAGHAN (N1Y2) SEGMENT - 6.7 KM

Wildlife
The Callaghan (N1Y2) segment traverses the Lower Callaghan Valley for approximately 3 km before crossing the railway, transmission lines and highway in the Cheakamus Valley and ascending a hillside on the east side of the valley. The wildlife use is virtually identical to that of the lower section of the Rainbow (MN) segment which is of importance to deer, particularly in spring.

The wildlife impact potential of segment N1Y2 is judged to be moderate in the Callaghan Valley and lower in the Cheakamus Valley; the overall potential is assessed as moderate.

Fish
Segment N1Y2 crosses only one stream, the Cheakamus River, adjacent to the BC Rail quarry; fisheries impact potential would be low and short term.

HIGH CHEAKAMUS (YZT) SEGMENT - 36.6 KM

Wildlife
The High Cheakamus (YZT) segment traverses CLI class 5 ungulate habitat for approximately half of its 38 km length; wildlife impact potential between node Y and Rubble Creek is negligible. Slightly higher (i.e. low) potential impacts are expected for the southern half of segment YZT as this section crosses higher capability deer habitat (CLI class 4 and 3W). Most of the southern half of the route is near the east side of the 5L42 ROW.

Segment YZT is judged to have an overall lower wildlife impact potential than the combined Upper and Lower Cheakamus segments and suboptions, because the lower, floodplain habitats and bald eagle feeding areas are avoided by use of segment YZT; the overall impact potential is judged to be low.

Fish
Segment YZT would require entirely new ROW clearing, and important streams are crossed in steep terrain where erosion control measures could be compromised, and cumulative impacts (increased suspended solids levels) at Cheakamus River could occur. Marble, Rubble, and Swift Creeks and Brohm River flow into the Cheakamus River (salmon and trout). Culliton Creek drains Warren Glacier and is turbid except during cold, dry periods. Low level, short-term increases in suspended solids levels could occur at each crossing. Use of new ROW, with new clearing could result in cumulative effects on the Cheakamus River.

The overall fisheries impact potential along segment YZT is assessed as low and short term.

PINECREST (Y1N2P1) SEGMENT - 21.6 KM

Wildlife
All of the Pinecrest (Y1N2P1) segment and its east suboption between nodes Y1 and N2 are in the heavily utilized corridor containing Highway 99 and three transmission lines (2L1/2L2 and 5L42). South on node N2 the route is west of the corridor for approximately 8 km before crossing over to join the High Cheakamus (YZT) segment at node P1. Wildlife information is limited in this area; however, considering that the route is in or near the existing corridor and in an area of relatively low capability habitat (class 5 for deer).

Wildlife impact potential is judged to be negligible-low.

Fish
Segment Y1N2P1 crosses Callaghan Creek, Brandywine Creek, Roe Creek, Shadow Lake, Cheakamus River near the confluence with Rubble Creek, and two small intermittent streams between node Y1 and Callaghan Creek. Callaghan, Brandywine and Roe Creeks support rainbow trout and possibly Dolly Varden char. Shadow Lake is part of the Daisy Lake reservoir and therefore subject to operational elevation changes. Shadow Lake also is periodically dredged to maintain flow capacity during drawdown for

hydroelectric production. Rainbow trout, Dolly Varden char, and possibly Kokanee are present.

The Cheakamus River supports important sports fisheries for rainbow trout and Dolly Varden. The route crosses a confluence area (Rubble Creek) which contains hydraulic features (pool, riffle alternation) that contribute to good fish habitat. The two intermittent streams are not important directly as fish habitat but provide inflows to Cheakamus River. The East (Y1YN2) suboption crosses the Cheakamus River twice, and Callaghan Creek. Fish population and habitat values would be the same as for the Y1YN2 section of the main route.

Stream crossings occur in terrain with deep valleys and/or steeply rising valley walls. ROW construction would result in crossings positioned well above the active channels. Construction impacts would be low and short-term. At Shadow Lake, habitat would not be affected by ROW construction. No impacts would be expected.

Fisheries impact potential is low and short term for both segment Y1N2P1 and suboption Y1YN2.

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Forsman, E., K. Horn, and G. Mires, Northern Spotted Owls. In: Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington, USDA, Forest Service, 1985.

Talisman Land Resource Consultants, Kelly Lake/Cheekye 500 kV Transmission Line, Resource Assessments, Terrain, Agriculture, Vegetation and Forestry, Wildlife, 1990.

LIST OF CONTACTS

Benn, Don, Juan de Fuca Consultants, Victoria, B.C.

Blood, Donald, D.A. Blood & Associates, Nanaimo, B.C.

Burgess, Tom, MOE, Wildlife Branch, Surrey, B.C.

Carlson, Glen, MOE, Wildlife Branch, Surrey, B.C.

Dodd, Chris, MOE, Wildlife Branch, Victoria, B.C.

Eakins, Robert, Whistler, B.C.

Forbes, Bob, MOE, Wildlife Branch, Surrey, B.C.

Green, Michael, B.C. Trappers Association, Prince George, B.C.

Holman, Phil, MOE, Wildlife Branch, Kamloops, B.C.

Kier, Kurt, MOE, Wildlife Branch, Kamloops, B.C.

Low, Dave, MOE, Wildlife Branch, Kamloops, B.C.

MacDonald, Sandy, MOE, Wildlife Branch, Kamloops, B.C.

Rande, Keith, District Conservation Officer, Squamish, B.C.

Retfalvi, Laszlo, Canadian Wildlife Service, Delta, B.C.

Sheriff, Doug, resident, Antoine Creek valley.

Trethewey, Don, Canadian Wildlife Services, Delta, B.C.

MAP SERIES IV

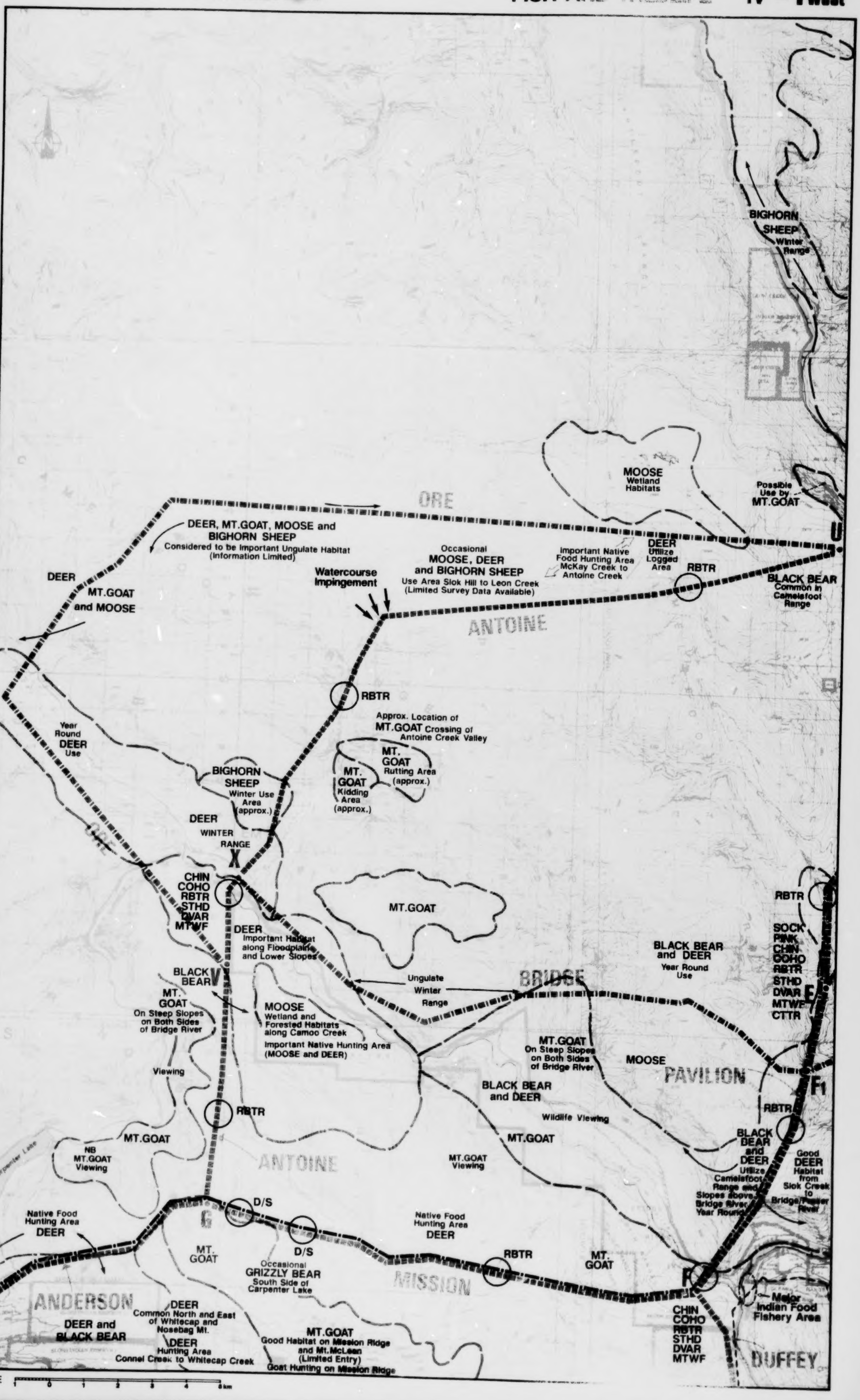
Fish and Wildlife

Camelsfoot	**1 West**
Fraser River	**1 East**
Bridge River	**2**
Cayoosh	**3**
Anderson	**4 North**
Duffey	**4 South**
Gates River	**5**
Pemberton Valley	**6**
Whistler	**7**
Cheakamus	**8**

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CAMELSFOOT

FISH AND WILDLIFE IV - 1 West


BIGHORN SHEEP Winter Range
MOOSE Wetland Habitats
Possible Use by MT.GOAT
ORE
DEER, MT.GOAT, MOOSE and BIGHORN SHEEP
Considered to be Important Ungulate Habitat (Information Limited)
Occasional MOOSE, DEER and BIGHORN SHEEP
Use Area Slok Hill to Leon Creek (Limited Survey Data Available)
Important Native Food Hunting Area McKay Creek to Antoine Creek
DEER Utilize Logged Area
U
RBTR
BLACK BEAR Common in Camelsfoot Range
DEER
MT.GOAT and MOOSE
Watercourse Impingement
ANTOINE
RBTR
Approx. Location of MT.GOAT Crossing of Antoine Creek Valley
MT. GOAT Rutting Area (approx.)
MT. GOAT Kidding Area (approx.)
Year Round DEER Use
BIGHORN SHEEP Winter Use Area (approx.)
DEER WINTER RANGE
X
ORE
CHIN
COHO
RBTR
STHD
DVAR
MTWF
MT.GOAT
DEER Important Habitat along Floodplains and Lower Slopes
BLACK BEAR
V
MT. GOAT On Steep Slopes on Both Sides of Bridge River
MOOSE Wetland and Forested Habitats along Camoo Creek
Important Native Hunting Area (MOOSE and DEER)
Ungulate Winter Range
BRIDGE
BLACK BEAR and DEER Year Round Use
RBTR
SOCK
PINK
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
E
Viewing
MT.GOAT On Steep Slopes on Both Sides of Bridge River
MOOSE
PAVILION
F1
BLACK BEAR and DEER
Wildlife Viewing
RBTR
RBTR
BLACK BEAR and DEER Utilize Camelsfoot Range and Slopes above Bridge River Year Round
Good DEER Habitat from Slok Creek to Bridge/Fraser River
Carpenter Lake
NB MT.GOAT Viewing
MT.GOAT
ANTOINE
MT.GOAT Viewing
MT.GOAT
Native Food Hunting Area DEER
G
D/S
D/S
Native Food Hunting Area DEER
MT. GOAT
Occasional GRIZZLY BEAR South Side of Carpenter Lake
RBTR
MT. GOAT
MISSION
F
ANDERSON
DEER and BLACK BEAR
DEER Common North and East of Whitecap and Nosebag Mt.
DEER Hunting Area Connel Creek to Whitecap Creek
MT.GOAT Good Habitat on Mission Ridge and Mt.McLean (Limited Entry)
Goat Hunting on Mission Ridge
CHIN
COHO
RBTR
STHD
DVAR
MTWF
Major Indian Food Fishery Area
DUFFEY
SCALE
1 0 1 2 3 4 5 km

FISH AND WILDLIFE

Map Series IV

LEGEND

TRANSMISSION SYSTEM

EXISTING

+··+··+	2L1 RoW - not utilized for 5L46
······	2L2
- - - -	2L90 and 2L91
-----	3L2
┅┅┅┅	5L41
—·—·	5L42

5L46 ROUTE ALTERNATIVES

┆┆┆┆	1989 NETWORK - Utilizing 2L1 RoW
▪▪▪▪	1989 NETWORK - Utilizing New RoW
▪ ▪ ▪	1989 NETWORK - Utilizing Existing Unoccupied RoW
┄┄┄	1990 ALTERNATIVES - Utilizing 2L1 RoW
▪┆▪┆	1990 ALTERNATIVES - Utilizing New RoW
•A	NETWORK NODE

FISH

∅	Stream Crossings
D/S	Key Issues Relate to Downstream Values

SPECIES

SALMON

SOCK	Sockeye
KKNE	Kokanee
COHO	Coho
CHIN	Chinook
PINK	Pink
CHUM	Chum

TROUT

RBTR	Rainbow
STHD	Steelhead
CTTR	Cutthroat

CHAR

DVAR	Dolly Varden

WHITEFISH

MTWF	Mountain Whitefish

WILDLIFE

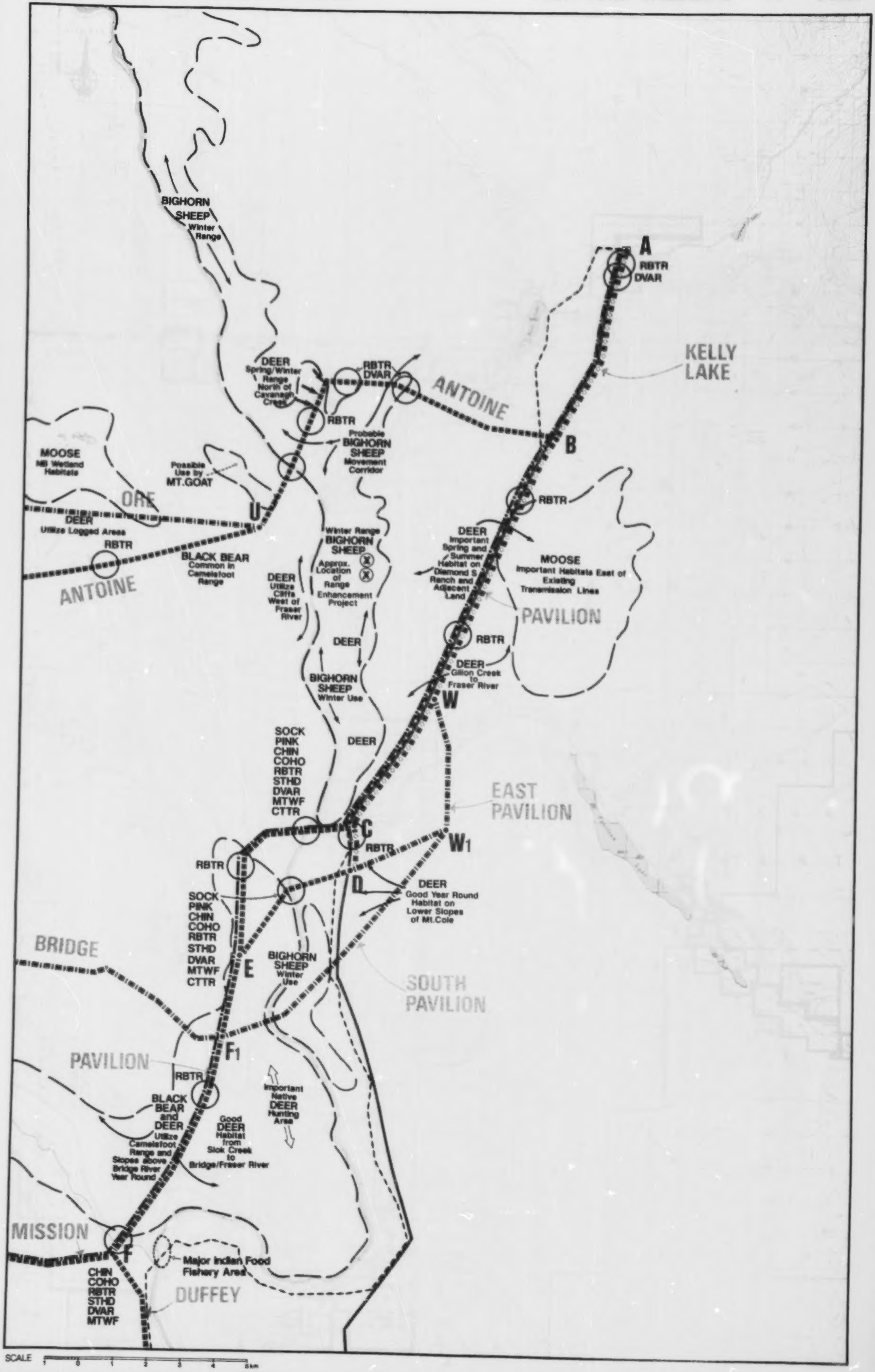
◯	Areas of known importance to various wildlife species & species groups

MAP SERIES IV
LEGEND
(Foldout) →

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

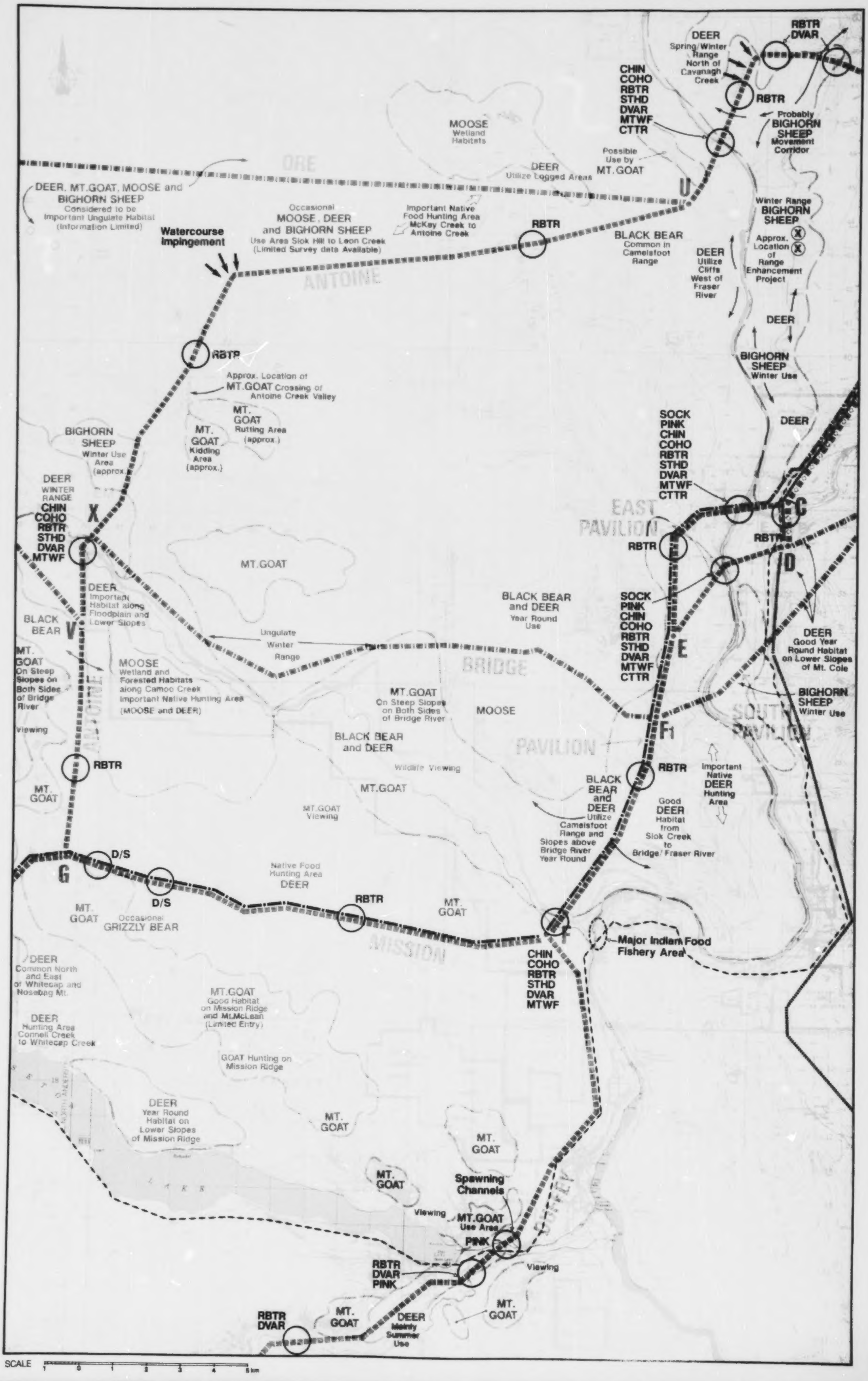
FRASER RIVER

FISH AND WILDLIFE IV - 1 East


BIGHORN SHEEP Winter Range
A
RBTR
DVAR
KELLY LAKE
DEER Spring/Winter Range North of Cavanagh Creek
RBTR
DVAR
ANTOINE
RBTR
B
MOOSE NB Wetland Habitats
Possible Use by MT.GOAT
Probable BIGHORN SHEEP Movement Corridor
ORE
U
DEER Utilize Logged Areas
RBTR
BLACK BEAR Common in Camelsfoot Range
ANTOINE
RBTR
Winter Range BIGHORN SHEEP
Approx. Location of Range Enhancement Project
DEER Utilize Cliffs West of Fraser River
DEER Important Spring and Summer Habitat on Diamond S Ranch and Adjacent Land
MOOSE Important Habitats East of Existing Transmission Lines
PAVILION
RBTR
DEER
DEER Gillon Creek to Fraser River
BIGHORN SHEEP Winter Use
W
DEER
SOCK
PINK
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
EAST PAVILION
C
RBTR
W1
RBTR
DEER Good Year Round Habitat on Lower Slopes of Mt.Cole
D
SOCK
PINK
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
BRIDGE
E
BIGHORN SHEEP Winter Use
SOUTH PAVILION
F1
PAVILION
RBTR
BLACK BEAR and DEER Utilize Camelsfoot Range and Slopes above Bridge River Year Round
Important Native DEER Hunting Area
Good DEER Habitat from Slok Creek to Bridge/Fraser River
MISSION
F
Major Indian Food Fishery Area
CHIN
COHO
RBTR
STHD
DVAR
MTWF
DUFFEY
SCALE
1
0
1
2
3
4
5km

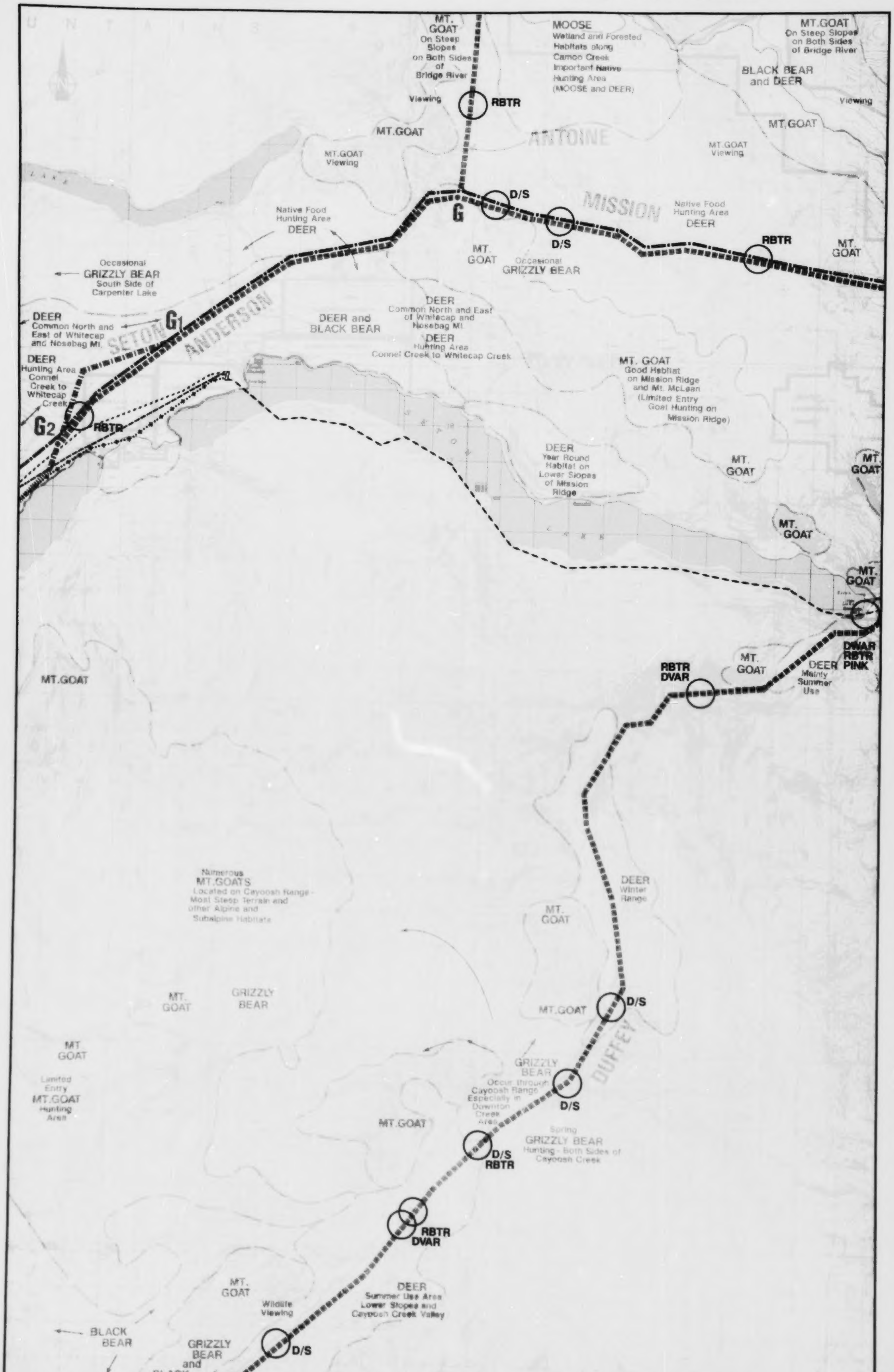
BRIDGE RIVER

FISH AND WILDLIFE


RBTR
DVAR
DEER
Spring/Winter Range North of Cavanagh Creek
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
RBTR
Probably BIGHORN SHEEP Movement Corridor
MOOSE
Wetland Habitats
Possible Use by MT.GOAT
DEER
Utilize Logged Areas
ORE
DEER, MT.GOAT, MOOSE and BIGHORN SHEEP
Considered to be Important Ungulate Habitat (Information Limited)
U
Winter Range BIGHORN SHEEP
Approx. Location of Range Enhancement Project
Occasional MOOSE, DEER and BIGHORN SHEEP
Use Area Siok Hill to Leon Creek (Limited Survey data Available)
Important Native Food Hunting Area McKay Creek to Antoine Creek
RBTR
BLACK BEAR
Common in Camelsfoot Range
DEER
Utilize Cliffs West of Fraser River
Watercourse Impingement
ANTOINE
DEER
RBTR
Approx. Location of MT.GOAT Crossing of Antoine Creek Valley
BIGHORN SHEEP
Winter Use
MT. GOAT
Rutting Area (approx.)
MT. GOAT
Kidding Area (approx.)
BIGHORN SHEEP
Winter Use Area (approx.)
DEER
SOCK
PINK
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
DEER
WINTER RANGE
CHIN
COHO
RBTR
STHD
DVAR
MTWF
X
EAST PAVILION
C
RBTR
RBTR
MT.GOAT
D
DEER
Important Habitat along Floodplain and Lower Slopes
BLACK BEAR and DEER
Year Round Use
SOCK
PINK
CHIN
COHO
RBTR
STHD
DVAR
MTWF
CTTR
DEER
Good Year Round Habitat on Lower Slopes of Mt. Cole
BLACK BEAR
V
Ungulate Winter Range
MT. GOAT
On Steep Slopes on Both Sides of Bridge River
MOOSE
Wetland and Forested Habitats along Camoo Creek
Important Native Hunting Area (MOOSE and DEER)
E
BRIDGE
BIGHORN SHEEP
Winter Use
SOUTH PAVILION
MT.GOAT
On Steep Slopes on Both Sides of Bridge River
MOOSE
Viewing
BLACK BEAR and DEER
PAVILION
F1
RBTR
Wildlife Viewing
RBTR
Important Native DEER Hunting Area
MT. GOAT
BLACK BEAR and DEER
Utilize Camelsfoot Range and Slopes above Bridge River Year Round
MT.GOAT
MT.GOAT
Viewing
Good DEER Habitat from Siok Creek to Bridge/Fraser River
D/S
G
D/S
Native Food Hunting Area
DEER
RBTR
MT. GOAT
MT. GOAT
Occasional GRIZZLY BEAR
MISSION
F
Major Indian Food Fishery Area
CHIN
COHO
RBTR
STHD
DVAR
MTWF
DEER
Common North and East of Whitecap and Nosebag Mt.
MT.GOAT
Good Habitat on Mission Ridge and Mt.McLean (Limited Entry)
DEER
Hunting Area Connell Creek to Whitecap Creek
GOAT Hunting on Mission Ridge
NORTH ANDERSON
DEER
Year Round Habitat on Lower Slopes of Mission Ridge
MT. GOAT
MT. GOAT
LAKE
MT. GOAT
Spawning Channels
Viewing
MT.GOAT
Use Area
PINK
DUFFEY
RBTR
DVAR
PINK
Viewing
RBTR
DVAR
MT. GOAT
DEER
Mainly Summer Use
MT. GOAT
SCALE
1
0
1
2
3
4
5 km

CAYOOSH

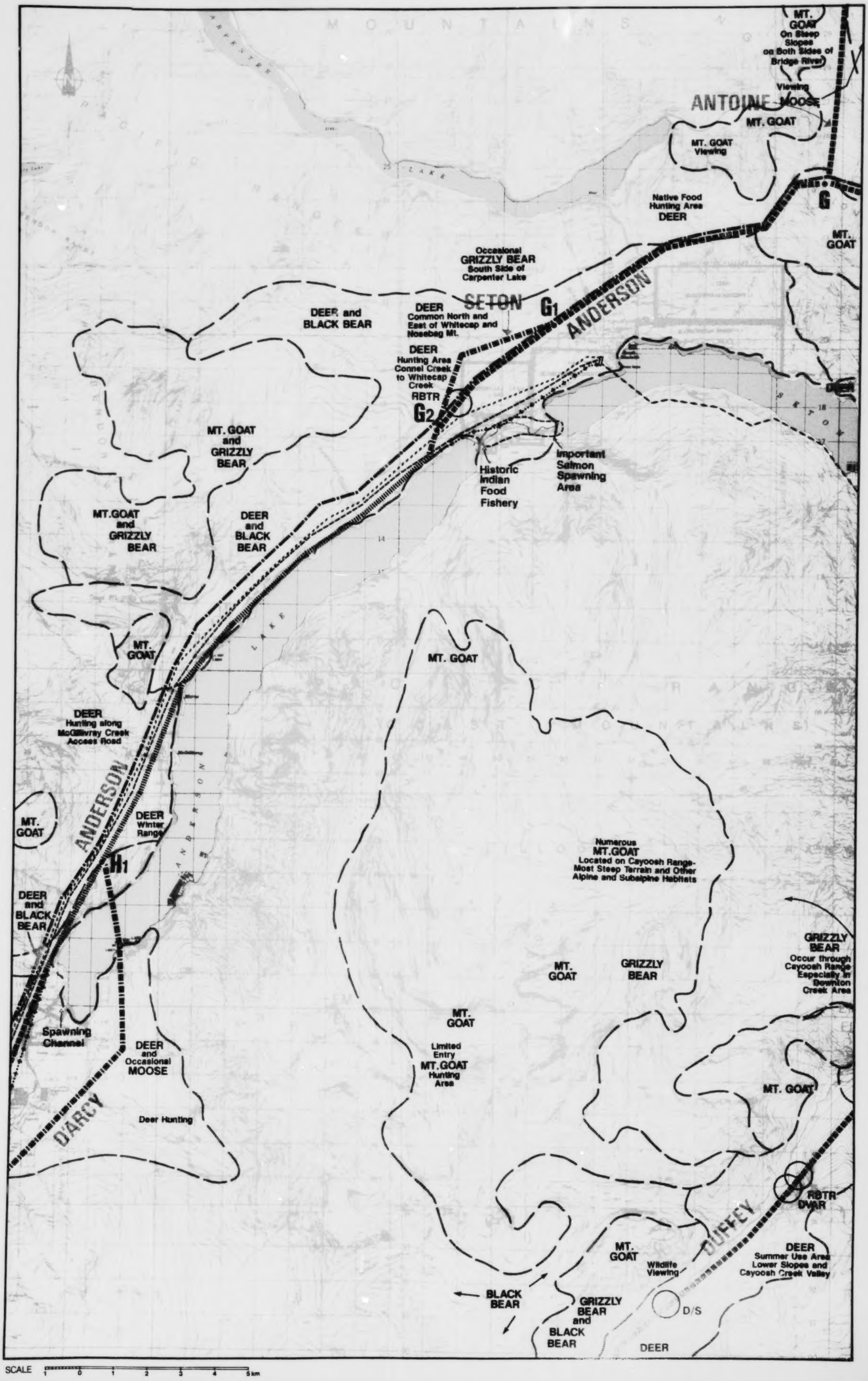
FISH AND WILDLIFE


MT. GOAT On Steep Slopes on Both Sides of Bridge River
Viewing
RBTR
MOOSE Wetland and Forested Habitats along Camoo Creek Important Native Hunting Area (MOOSE and DEER)
MT.GOAT On Steep Slopes on Both Sides of Bridge River
BLACK BEAR and DEER
Viewing
MT.GOAT
MT.GOAT
ANTOINE
MT.GOAT Viewing
MT.GOAT Viewing
LAKE
G
D/S
MISSION
D/S
Native Food Hunting Area DEER
Native Food Hunting Area DEER
RBTR
MT. GOAT
MT. GOAT
Occasional GRIZZLY BEAR
Occasional GRIZZLY BEAR South Side of Carpenter Lake
DEER Common North and East of Whitecap and Nosebag Mt.
G1
SETON
ANDERSON
DEER and BLACK BEAR
DEER Common North and East of Whitecap and Nosebag Mt.
DEER Hunting Area Connel Creek to Whitecap Creek
DEER Hunting Area Connel Creek to Whitecap Creek
G2
RBTR
MT. GOAT Good Habitat on Mission Ridge and Mt. McLean (Limited Entry Goat Hunting on Mission Ridge)
DEER Year Round Habitat on Lower Slopes of Mission Ridge
MT. GOAT
MT. GOAT
MT. GOAT
MT. GOAT
MT.GOAT
RBTR DVAR
MT. GOAT
DEER Mainly Summer Use
DWAR RBTR PINK
Numerous MT.GOATS Located on Cayoosh Range - Most Steep Terrain and other Alpine and Subalpine Habitats
DEER Winter Range
MT. GOAT
MT. GOAT
GRIZZLY BEAR
MT GOAT
Limited Entry MT.GOAT Hunting Area
MT.GOAT
D/S
DUFFEY
GRIZZLY BEAR Occur through Cayoosh Range Especially in Downton Creek Area
D/S
MT.GOAT
D/S RBTR
Spring GRIZZLY BEAR Hunting - Both Sides of Cayoosh Creek
RBTR DVAR
MT. GOAT
Wildlife Viewing
DEER Summer Use Area Lower Slopes and Cayoosh Creek Valley
BLACK BEAR
GRIZZLY BEAR and BLACK BEAR
D/S
DEER
SCALE
1
0
1
2
3
4
5km

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

ANDERSON

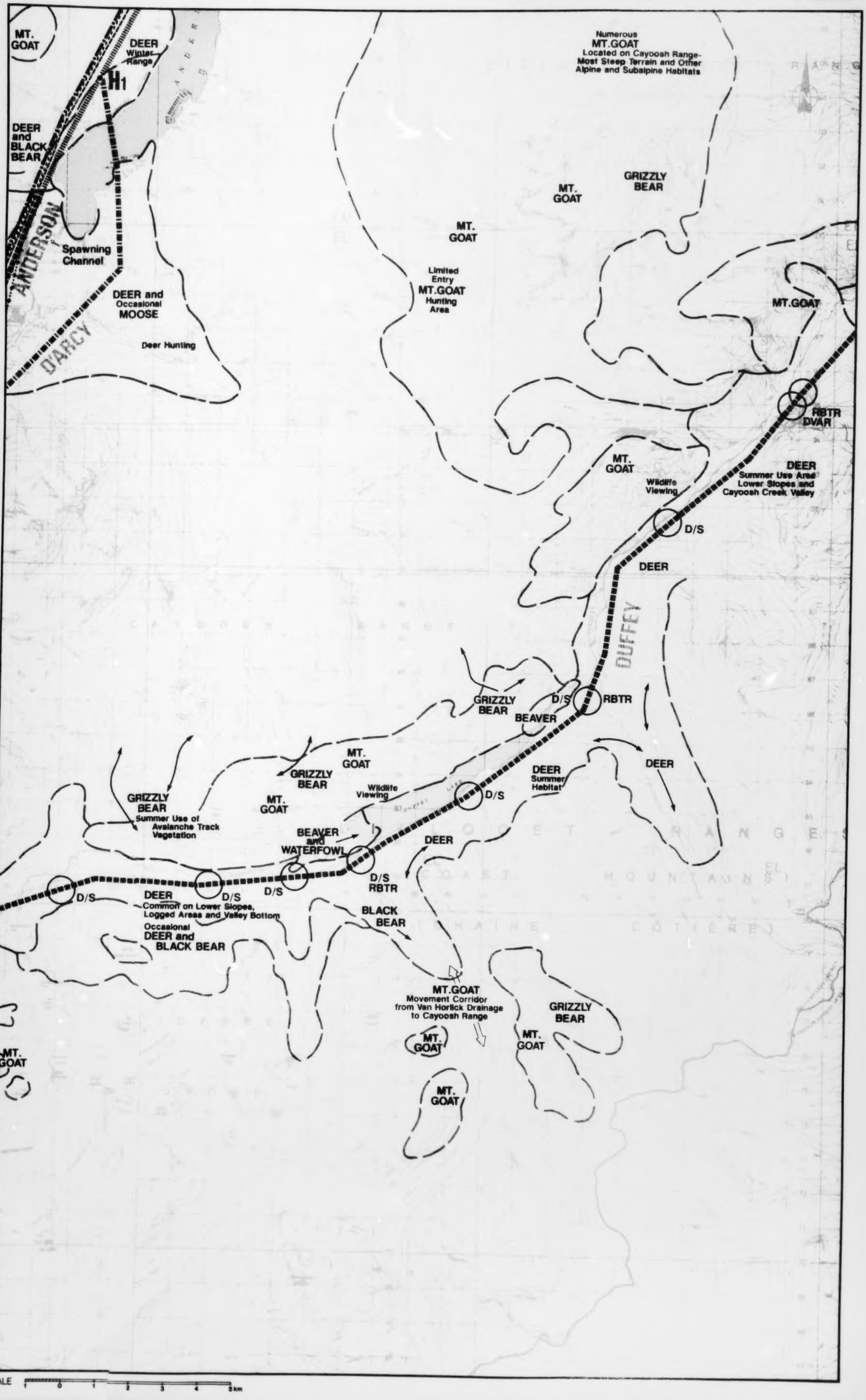
FISH AND WILDLIFE IV – 4 North


MOUNTAINS
LAKE
MT. GOAT On Steep Slopes on Both Sides of Bridge River
Viewing
ANTOINE MOOSE
MT. GOAT
MT. GOAT Viewing
Native Food Hunting Area DEER
G
MT. GOAT
Occasional GRIZZLY BEAR South Side of Carpenter Lake
SETON
G1
ANDERSON
DEER and BLACK BEAR
DEER Common North and East of Whitecap and Nosebag Mt.
DEER Hunting Area Connel Creek to Whitecap Creek
RBTR
G2
DEER
MT. GOAT and GRIZZLY BEAR
MT.GOAT and GRIZZLY BEAR
DEER and BLACK BEAR
Historic Indian Food Fishery
Important Salmon Spawning Area
MT. GOAT
LAKE
MT. GOAT
DEER Hunting along McGillivray Creek Access Road
ANDERSON
MT. GOAT
DEER Winter Range
H1
DEER and BLACK BEAR
Numerous MT.GOAT Located on Cayoosh Range-Most Steep Terrain and Other Alpine and Subalpine Habitats
GRIZZLY BEAR Occur through Cayoosh Range Especially in Downton Creek Area
MT. GOAT
GRIZZLY BEAR
MT. GOAT
Limited Entry MT.GOAT Hunting Area
Spawning Channel
DEER and Occasional MOOSE
D'ARCY
Deer Hunting
MT. GOAT
RBTR DVAR
DUFFEY
DEER Summer Use Area Lower Slopes and Cayoosh Creek Valley
MT. GOAT
Wildlife Viewing
BLACK BEAR
GRIZZLY BEAR and BLACK BEAR
D/S
DEER
SCALE
1 0 1 2 3 4 5 km

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

DUFFEY

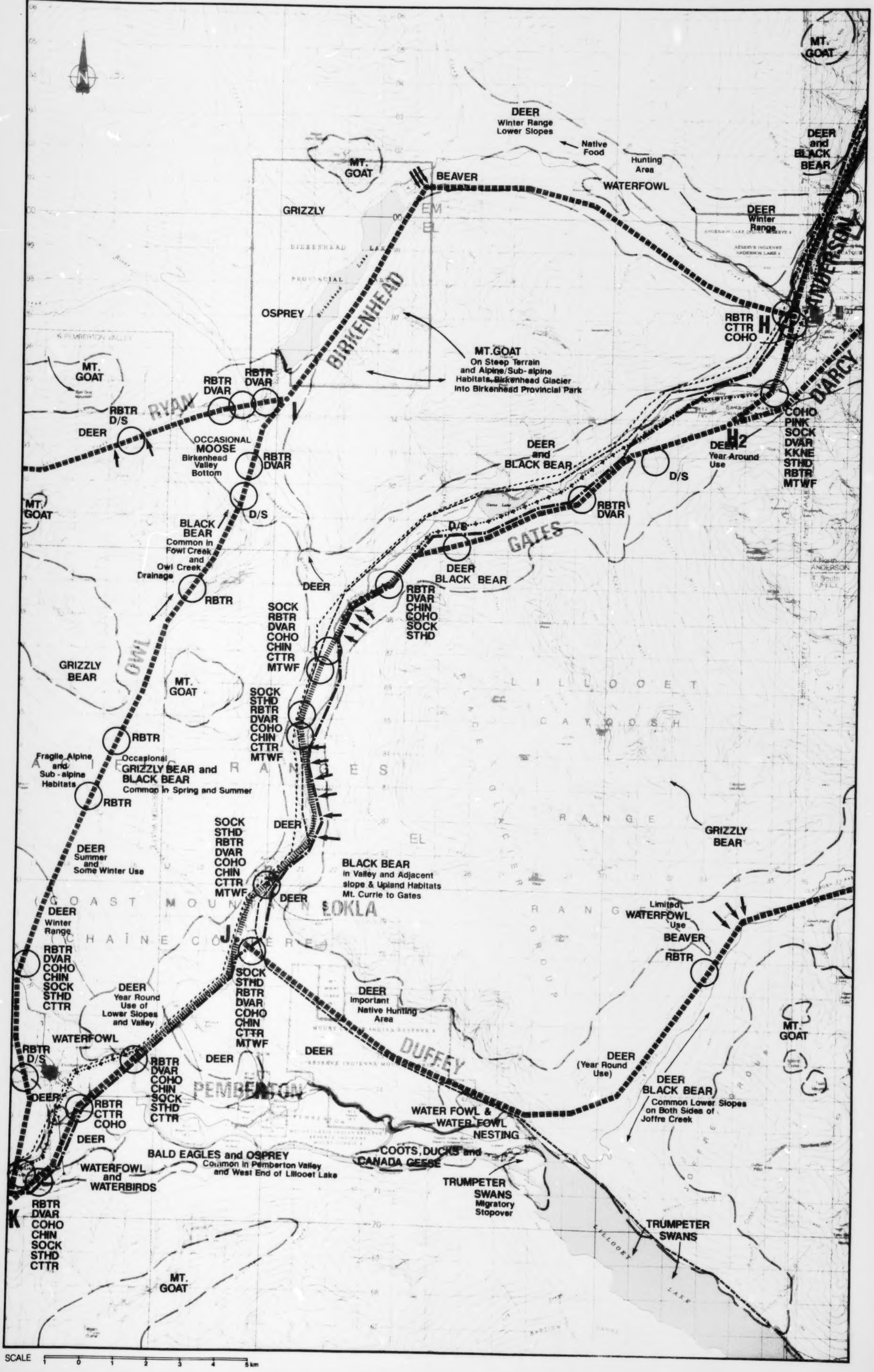
FISH AND WILDLIFE IV – 4 South


MT. GOAT
DEER Winter Range
H1
DEER and BLACK BEAR
ANDERSON
Spawning Channel
DEER and Occasional MOOSE
D'ARCY
Deer Hunting
Numerous MT.GOAT Located on Cayoosh Range-Most Steep Terrain and Other Alpine and Subalpine Habitats
GRIZZLY BEAR
MT. GOAT
MT. GOAT
Limited Entry MT.GOAT Hunting Area
MT.GOAT
RBTR DVAR
MT. GOAT
Wildlife Viewing
DEER Summer Use Area Lower Slopes and Cayoosh Creek Valley
D/S
DEER
DUFFEY
GRIZZLY BEAR
D/S
RBTR
BEAVER
MT. GOAT
GRIZZLY BEAR
DEER
DEER Summer Habitat
Wildlife Viewing
D/S
GRIZZLY BEAR Summer Use of Avalanche Track Vegetation
MT. GOAT
BEAVER and WATERFOWL
DEER
D/S
D/S RBTR
D/S
D/S
DEER Common on Lower Slopes, Logged Areas and Valley Bottom
Occasional DEER and BLACK BEAR
BLACK BEAR
MT.GOAT Movement Corridor from Van Horlick Drainage to Cayoosh Range
GRIZZLY BEAR
MT. GOAT
MT. GOAT
MT. GOAT
MT. GOAT
SCALE
1 0 1 2 3 4 5km

KELLY LAKE - CHEEKYE
500 kV TRANSMISSION LINE

GATES RIVER

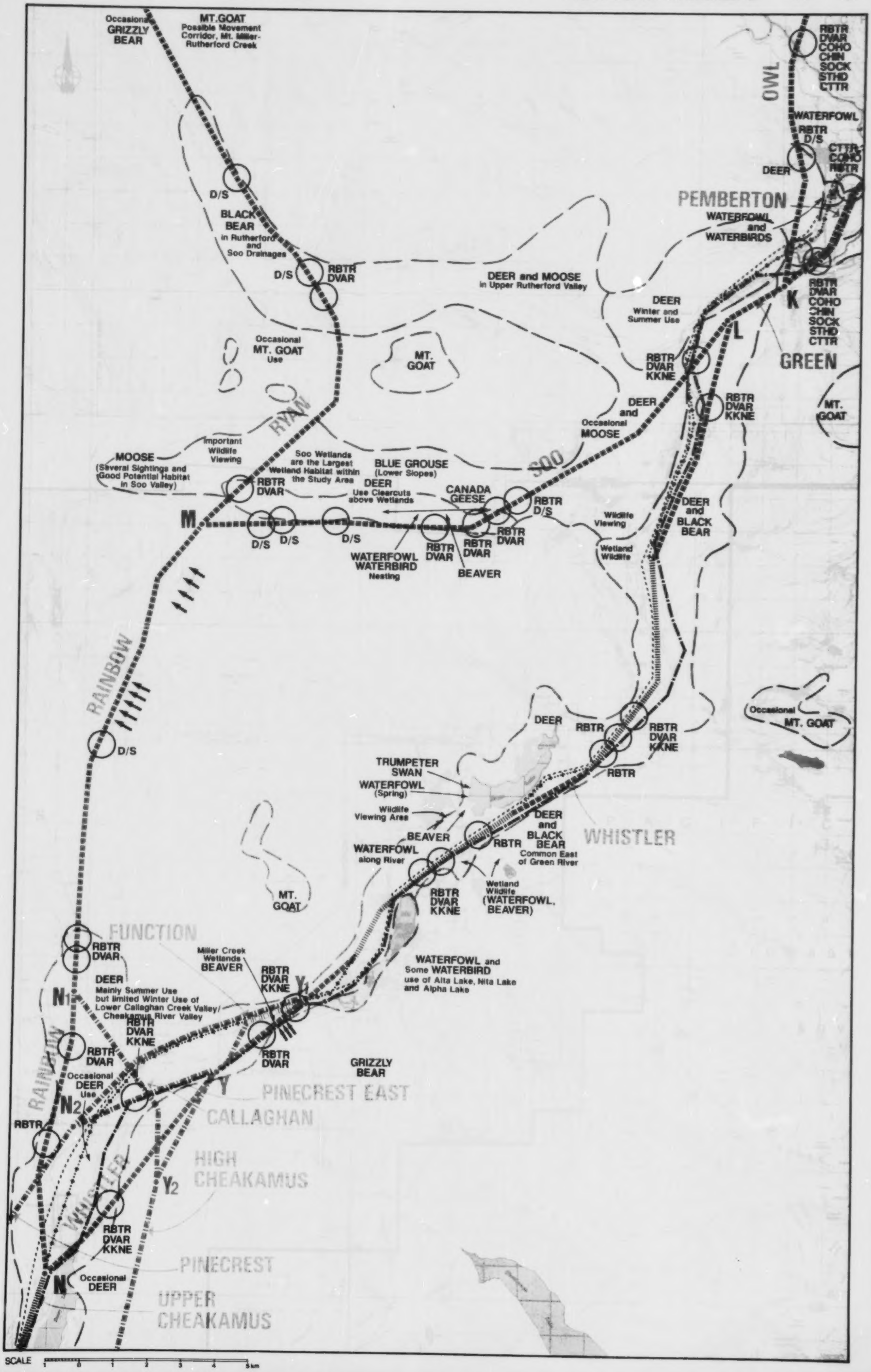
FISH AND WILDLIFE IV – 5


N
MT. GOAT
DEER Winter Range Lower Slopes
Native Food
Hunting Area
WATERFOWL
DEER and BLACK BEAR
MT. GOAT
BEAVER
GRIZZLY
DEER Winter Range
ANDERSON
OSPREY
BIRKENHEAD
RBTR CTTR COHO
H
MT.GOAT On Steep Terrain and Alpine/Sub-alpine Habitats, Birkenhead Glacier into Birkenhead Provincial Park
MT. GOAT
RBTR DVAR
RBTR DVAR
RYAN
RBTR D/S
DEER
D'ARCY
COHO PINK SOCK DVAR KKNE STHD RBTR MTWF
OCCASIONAL MOOSE Birkenhead Valley Bottom
RBTR DVAR
DEER and BLACK BEAR
H2
DEER Year Around Use
D/S
MT. GOAT
D/S
RBTR DVAR
BLACK BEAR Common in Fowl Creek and Owl Creek Drainage
D/S
GATES
DEER BLACK BEAR
DEER
RBTR
RBTR DVAR CHIN COHO SOCK STHD
SOCK RBTR DVAR COHO CHIN CTTR MTWF
GRIZZLY BEAR
OWL
MT. GOAT
LILLOOET
CAYOOSH
SOCK STHD RBTR DVAR COHO CHIN CTTR MTWF
RBTR
Fragile Alpine and Sub-alpine Habitats
Occasional GRIZZLY BEAR and BLACK BEAR Common in Spring and Summer
RANGES
RBTR
RANGE
GRIZZLY BEAR
DEER
SOCK STHD RBTR DVAR COHO CHIN CTTR MTWF
DEER Summer and Some Winter Use
BLACK BEAR in Valley and Adjacent slope & Upland Habitats Mt. Currie to Gates
DEER
COAST MOUNTAIN
LOKLA
RANGE
Limited WATERFOWL Use
DEER Winter Range
J
CHAÎNE CÔTIÈRE
BEAVER
RBTR
RBTR DVAR COHO CHIN SOCK STHD CTTR
SOCK STHD RBTR DVAR COHO CHIN CTTR MTWF
DEER Year Round Use of Lower Slopes and Valley
DEER Important Native Hunting Area
MT. GOAT
WATERFOWL
RBTR D/S
DEER
DEER
DUFFEY
DEER (Year Round Use)
RBTR DVAR COHO CHIN SOCK STHD CTTR
DEER
PEMBERTON
DEER BLACK BEAR Common Lower Slopes on Both Sides of Joffre Creek
RBTR CTTR COHO
WATER FOWL & WATER FOWL NESTING
DEER
BALD EAGLES and OSPREY Common in Pemberton Valley and West End of Lillooet Lake
COOTS, DUCKS and CANADA GEESE
WATERFOWL and WATERBIRDS
TRUMPETER SWANS Migratory Stopover
K
RBTR DVAR COHO CHIN SOCK STHD CTTR
TRUMPETER SWANS
LILLOOET LAKE
MT. GOAT
SCALE
1 0 1 2 3 4 5 km

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

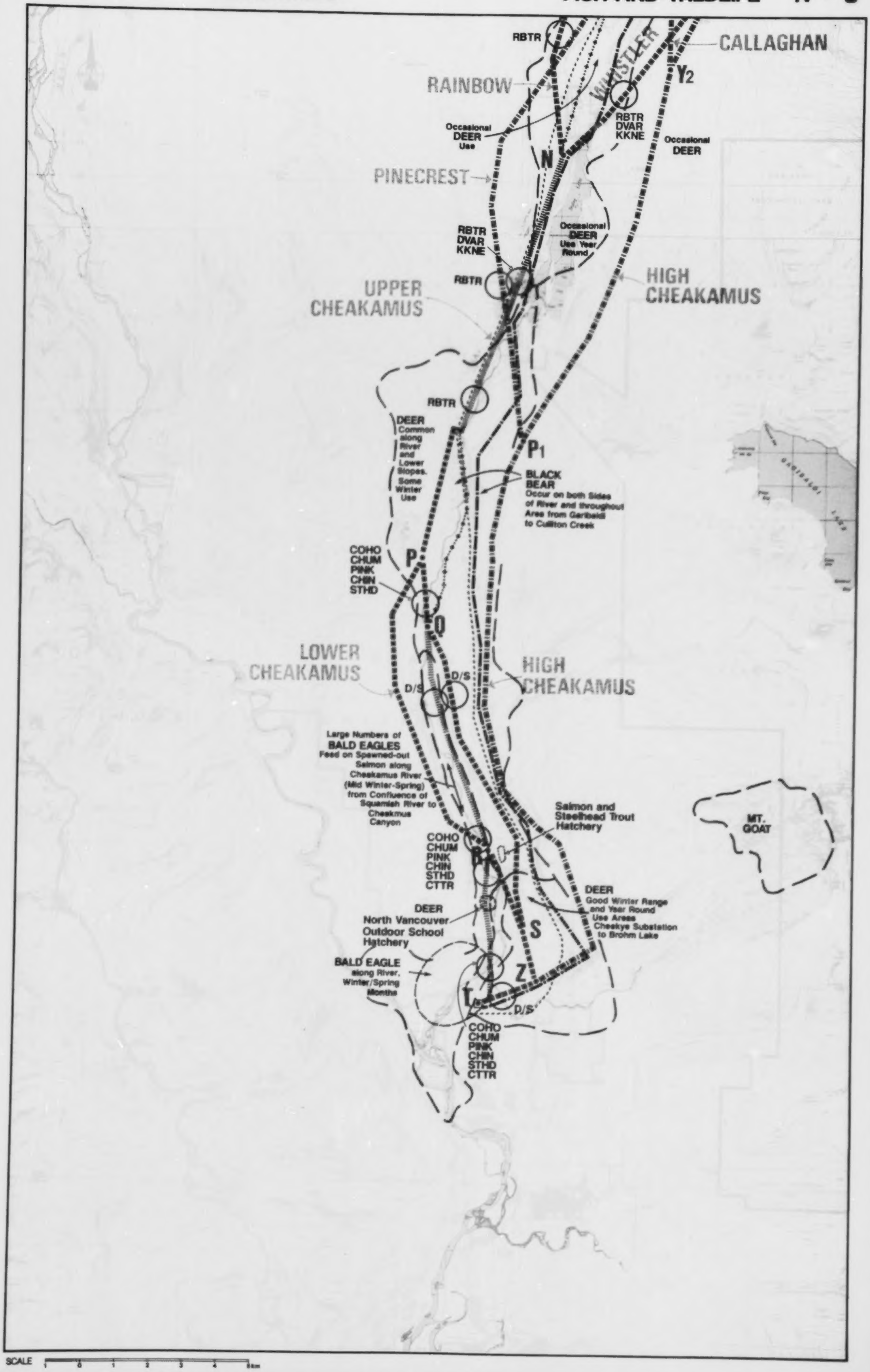
WHISTLER

FISH AND WILDLIFE IV - 7


Occasional GRIZZLY BEAR
MT. GOAT Possible Movement Corridor, Mt. Miller-Rutherford Creek
D/S
BLACK BEAR in Rutherford and Soo Drainages
D/S
RBTR DVAR
DEER and MOOSE in Upper Rutherford Valley
DEER Winter and Summer Use
Occasional MT. GOAT Use
MT. GOAT
RYAN
RBTR DVAR KKNE
RBTR DVAR KKNE
DEER and Occasional MOOSE
Important Wildlife Viewing
MOOSE (Several Sightings and Good Potential Habitat in Soo Valley)
Soo Wetlands are the Largest Wetland Habitat within the Study Area
BLUE GROUSE (Lower Slopes)
DEER Use Clearcuts above Wetlands
SOO
RBTR DVAR
CANADA GEESE
RBTR D/S
M
D/S
D/S
D/S
RBTR DVAR
RBTR DVAR
RBTR DVAR
WATERFOWL WATERBIRD Nesting
BEAVER
Wildlife Viewing
Wetland Wildlife
DEER and BLACK BEAR
RAINBOW
D/S
OWL
RBTR DVAR COHO CHIN SOCK STHD CTTR
WATERFOWL
RBTR D/S
DEER
CTTR COHO RBTR
PEMBERTON
WATERFOWL and WATERBIRDS
RBTR DVAR COHO CHIN SOCK STHD CTTR
K
L
GREEN
MT. GOAT
Occasional MT. GOAT
DEER
RBTR
RBTR DVAR KKNE
RBTR
TRUMPETER SWAN
WATERFOWL (Spring)
Wildlife Viewing Area
BEAVER
WATERFOWL along River
DEER and BLACK BEAR Common East of Green River
RBTR
WHISTLER
Wetland Wildlife (WATERFOWL, BEAVER)
RBTR DVAR KKNE
MT. GOAT
FUNCTION
RBTR DVAR
Miller Creek Wetlands BEAVER
DEER Mainly Summer Use but limited Winter Use of Lower Callaghan Creek Valley/ Cheakamus River Valley
N1
RBTR DVAR KKNE
Y1
WATERFOWL and Some WATERBIRD use of Alta Lake, Nita Lake and Alpha Lake
RBTR DVAR
RBTR DVAR
GRIZZLY BEAR
Occasional DEER Use
RAINBOW
N2
Y
PINECREST EAST
CALLAGHAN
RBTR
HIGH CHEAKAMUS
Y2
WHISTLER
RBTR DVAR KKNE
PINECREST
N
Occasional DEER
UPPER CHEAKAMUS
SCALE
1 0 1 2 3 4 5km

CHEAKAMUS

FISH AND WILDLIFE


RBTR
CALLAGHAN
RAINBOW
WHISTLER
Y2
Occasional DEER Use
RBTR DVAR KKNE
Occasional DEER
N
PINECREST
RBTR DVAR KKNE
Occasional DEER Use Year Round
RBTR
UPPER CHEAKAMUS
HIGH CHEAKAMUS
RBTR
DEER Common along River and Lower Slopes. Some Winter Use
P1
BLACK BEAR Occur on both Sides of River and throughout Area from Garibaldi to Culliton Creek
GARIBALDI LAKE
P
COHO CHUM PINK CHIN STHD
Q
LOWER CHEAKAMUS
D/S
D/S
HIGH CHEAKAMUS
Large Numbers of BALD EAGLES Feed on Spawned-out Salmon along Cheakamus River (Mid Winter-Spring) from Confluence of Squamish River to Cheakmus Canyon
Salmon and Steelhead Trout Hatchery
MT. GOAT
COHO CHUM PINK CHIN STHD CTTR
R
DEER Good Winter Range and Year Round Use Areas Cheekye Substation to Brohm Lake
DEER North Vancouver Outdoor School Hatchery
S
BALD EAGLE along River, Winter/Spring Months
Z
T
D/S
COHO CHUM PINK CHIN STHD CTTR
SCALE
1 0 1 2 3 4 5 km

V
RECREATION AND AESTHETICS

The Study Area is almost entirely mountainous, although certain wide valleys and plateaus provide some moderate topography. There is a great variety of water bodies: small mountain streams; tarns; small, warm-water lakes; major rivers; and several large lakes up to 20 km long. Climatic conditions also vary greatly: to the southwest, strong coastal influences result in a relatively mild, wet climate; while to the northeast one of the driest zones in the province is encountered.

Topographic and climatic factors contribute to highly varied landscapes, natural features and flora and fauna. There is an extremely wide range of high quality recreation opportunities for all seasons of the year. In addition to the important natural attractions, the region lies in close proximity to the large population based in the Lower Mainland. Over the last two decades, road access has improved and Whistler has matured as a major tourist destination. Skiing, wilderness activities and viewing within the region are amongst the best in Western Canada.

The Study Area is experiencing an expanding development period; alpine skiing and services at Whistler are the focus of most activity and there is growing interest in developing all-season tourist attractions including expansion of recreation opportunities outside of Whistler. Attractions such as Rainbow Mountain, Cheakamus Valley and the Callaghan Valley are being discussed for recreation and tourism development. Highway 99 to Whistler is being continually upgraded and paving of the Duffey Lake Road between Pemberton and Lillooet should be completed in 1991 which would create a circular tour from Vancouver via Squamish, Whistler, Pemberton, Lillooet, Lytton, and Hope and should significantly increase tourist and recreation use, especially northeast of Whistler.

MAJOR ATTRACTIONS

The major recreation attractions in the Study Area are summarized as follows:

- High Quality Landscapes - Pavilion Mountain, Fraser, Bridge and Cayoosh river canyons, Anderson, Seton and Duffey lakes, Joffre Lake area, Pemberton Valley, Birkenhead Lake Park, Owl-Tenquille Uplands, Ryan Creek Valley, Rainbow Mountain, Callaghan Lake, Garibaldi Park, Tantalus Range, Cheakamus Canyon.
- Landscape Viewing - from Pavilion Mountain Road, Highway 12, Bridge River Road, BC Rail, Highline Road, Duffey Lake Road, Birkenhead Lake Road, Pemberton Valley roads, Highway 99, Whistler and Blackcomb ski areas.
- Waterfalls - Nairn, Brandywine, Alexander and Fowl Creek.
- Geologic Features - Cheakamus Canyon, Fraser Canyon, Cayoosh Canyon, Green River slide, Bridge River gorge, volcanic features in Garibaldi and Brandywine Falls parks.
- Rock Hounding - Bridge River area.
- Glaciers - Place Glacier is a major, trail-accessed glacier; others include: Birkenhead Peak, Matier Glacier (Joffre Lakes), Ipsoot Glacier and those in Garibaldi Park.
- Angling - Cheakamus River steelhead; numerous trout and/or salmon lakes and streams.
- Wildlife Viewing - deer, black bear and birds throughout the region; mountain goat and grizzly bear in central portions of the Study Area; mountain sheep to the northeast; salmon runs on the Fraser, Bridge, Seton, Lillooet and Cheakamus rivers.
- Nature Appreciation - Lillooet River and Soo River wetlands; Showh Lakes mature cedar; Cayoosh Pass white pine; biotic transitions including six biogeoclimatic zones.
- Hunting - opportunities throughout; remote limited entry hunts in mountain areas such as the Cayoosh Range.
- Mountaineering and Climbing - good opportunities throughout, especially in Garibaldi Park, Joffre Lakes area, and the Cayoosh Range.
- Swimming and Beach Activities - Alta, Gates, Anderson, Birkenhead and Seton lakes.
- Boating, Canoeing and Windsurfing - Anderson, Seton and Gates lakes and Green Lake and Alta Lake at Whistler.
- Kayaking and Rafting - lower Cheakamus and Fraser rivers.
- Hiking and Wilderness Recreation - alpine terrain throughout, especially in southern and central portions of the Study Area (Rainbow, Garibaldi, Owl-Fowl, Joffre Lakes).
- Camping and Picnicking - high quality opportunities throughout the Study Area.
- Developed Ski Areas - Whistler and Blackcomb mountains.
- Heli-skiing and Heli-hiking - Whistler area and nearby mountains such as Brandywine, Fitzsimmons and Spearhead.
- Cross-Country Winter Activities - throughout the south Coast Mountains; Cheakamus Lake, Callaghan Lake, 16-Mile Creek, Brandywine Park, Daisy Lake, Singing Pass, and Diamond Head.
- Historic and Archaeological Features - Pavilion area; Lillooet-Seton River; and Seton Portage.
- Cultural Features - Mount Currie Indian Reserve; Pemberton Valley farmlands; Pavilion Mountain rangelands; Bridge and Lillooet river native fisheries.
- Man-Made Features - Bridge River and Seton Lake electric generation facilities; fish spawning channels and hatcheries at Seton River, D'Arcy and the lower Cheakamus River.

The Study Area contains approximately 40 non-urban parks and recreation facilities which are administered by several provincial and local agencies. In addition, there are numerous municipal parks and commercial recreation facilities in the Whistler area. The

Ministry of Parks (MOP) administers seven Class A Provincial Parks and a large, recently established Recreation Area at Joffre Lakes. In addition, there are 36 areas identified for the Use, Recreation, and Enjoyment of the Public (UREP's); these vary in importance from pending park proposals to map notations of access opportunities to shorelines. Some of the UREP's are occupied by MOF recreation sites. Table V-1 provides a summary of regional provincial park data.

The MOP currently has four important proposals in the Study Area:

- Callaghan Lake Recreation Area Proposal - 10,000 ha encompassing the upper Callaghan Creek drainage and including Powder Mountain and Callaghan Lake. It would be developed for camping, wilderness trails and skiing.
- Mount Ronayne Recreation Area Proposal - 3,700 ha of varied alpine and sub-alpine terrain between the Lillooet and Birkenhead rivers. It has been used for hiking, trail riding and wilderness activities for a number of years.
- Duffey Lake Park Proposal - a 24 ha Class "A" park proposal at the southwest end of Duffey Lake. Camping, day-use and beach facilities are planned and its location as a trail head for adjacent mountain trips would be developed.
- Brohm Lake Park Study - Class "A" park status for Brohm Lake is being studied. It presently is a very high use site with a small recreation facility administered by the MOF.

The MOP's major concern regarding 5L46 is the creation of ROWs through existing parks or recreation areas (Birkenhead Lake, Nairn Falls, Brandywine Falls and Joffre Lakes), through UREP's (such as near Brandywine Falls Park) and through or near park/recreation area proposals (such as Mount Ronayne, Brohm Lake and Duffey Lake).

The MOF manages 24 recreation sites in the Study Area. Generally, these are small, mainly user-maintained sites offering primitive camping, shore access and/or day-use facilities. Most are accessed by secondary roads. The MOF also maintains trails such as in the Rainbow Mountain and Owl Lake areas. Due to increasing use, trails in these areas are being upgraded and expanded.

The MOF also plays an important role in recreation and landscape planning in the region. Since 1980, they have been involved in the Whistler Land Resource Use Plan in cooperation with Whistler. This process has recently been expanded to cover the Highway 99 corridor from Howe Sound to Cayoosh Pass.

The major concern of the MOF with regard to 5L46 and recreation is the possible utilization of new areas, especially the Duffey Lake corridor, Rainbow Mountain area and Owl-Fowl-Ogre alpine unit. This opinion was echoed by all other agencies and organizations contacted regarding their interest in recreation and tourism: the MOE, SLRD, Whistler, and the Ministry of Crown Lands.

BC Hydro manages the Seton Lake Reservoir Recreation Area, an attractive site at the east end of Seton Lake and along the Seton River near Lillooet. Facilities include a 29-unit campground, road-side view point, 244 m developed beach, several parking areas, day-use tables and 4.5 km of interpretive trails. Camping, boating, water skiing, and historic appreciation are the main activities. Between 1983 and 1989 annual attendance has averaged 24,109 visitor-days and 2,492 visitor-nights (BC Hydro, 1988).

BC Hydro is presently planning two new recreation sites in the Study Area: at South Shalalth a small beach and picnic site on the shore of Seton Lake is proposed; and at Stanley Lake, near Daisy Lake, they are considering the re-establishment of a campground.

Several road-side viewpoints are found in the Study Area. Many of these appear to be informal, wide shoulder areas with no facilities or management. A few are recognized pull-offs with garbage collection. The most important highway site is on Highway 99 at the Cheakamus Canyon overlooking the Tantalus Range to the southwest. While data is not available, it is suggested that this is the most photographed and viewed landscape in the Study Area.

Away from Whistler, there are two non-urban Municipal Parks: One Mile Lake Park near Pemberton; and Cayoosh Park near Lillooet at the mouth of the Seton River. The SLRD has no park function. The Whistler area contains the greatest concentration of commercial and public recreation facilities within the Study Area: approximately 30 ski lifts on Whistler and Blackcomb mountains; six helicopter skiing and hiking operations; eleven bike rental businesses; two river rafting operators; seven sailing, canoeing or

TABLE V-1

STUDY AREA PROVINCIAL PARKS

PARK	AREA (ha)	FACILITIES	1988 ATTENDANCE (parties)
Downing	100	23 campsites, 7 tables, 7213 m beach	703 campground 5,904 day-use
Seton Portage	1	none	N/A
Birkenhead	3,642	105 campsites, 18 tables, 305 m beach, boat launch ramp, 2 km trails	2,772 campground
Nairn Falls	171	88 campsites 3 tables, 2 km trails	4,034 campground 2,181 day-use
Brandywine Falls	148	15 campsites, 6 tables, 1 km trail, 5 km ski trails	889 campground 25,985 day-use
Garibaldi	194,324	196 campsites, 62 km trails, 23 km ski trails	2,726 campground 17,887 day-use
Alice Lake	397	88 campsites, 88 tables, 229 m beach, 7 km trails	7,734 campground 63,483 day-use
Joffre Lakes Recreation Area	1,460	trail and parking lot	N/A

Source: MOP, Park Data Handbook - 1988

windsurfing rental operations; several kayaking, backcountry and wilderness outfitters; several bus and van touring businesses; and, about 18 municipal parks with extensive trail systems both along the valley bottom and extending into nearby alpine and mountainous areas.

IMPACT ASSESSMENT

For the purposes of assessing potential transmission line recreation and aesthetic impact potential, four classes of relative impact are identified: severe, high, moderate, and low. Four factors were taken into account when rating the relative impacts of more or less homogenous sections of a route segment: resource quality; resource sensitivity; existing use or visibility; and relative change in condition. Table V-2 summarizes how the ranking of the four factors led to assigning potential impacts. Other factors were also taken into account such as potential future use in areas currently being considered for park and recreational development.

1989 NETWORK DESCRIPTIONS

KELLY LAKE (AB) - 6.0 KM

The Kelly Lake (AB) segment is mainly comprised of moderately sloping, closed forest terrain of low visual quality. There are no parks, reserves or recreation facilities, and recreation feature significance is low. Downing Provincial Park is located 2.5 km to the southwest of the existing transmission line crossing of the road. The main visual impact would be upon travellers on the Clinton/Canoe Creek road. The lines cross the road at right angles and are only visible for a short duration from the road, but the increased ROW width would be visible ascending the hillside.

Overall recreation and aesthetic impact potential is rated as low partly because 5L46 would parallel the eastern edge of two existing transmission line ROWs and visual impacts would be only incremental.

PAVILION (BCEF) - 29.3 KM

The Pavilion (BCEF) segment is sub-divided into three sections - BC, CE and EF - and the Fraser (CDE) suboption.

The overall recreation and aesthetic impact potential for segment BCEF is rated as low; the impact potential for suboption CDE is low for recreation and severe for aesthetics.

Section BC

Section BC is mainly comprised of rolling plateau terrain with an attractive mix of cultivated lands, pastures, forests, open rangelands and small wetlands readily viewed from the historic Pavilion Mountain Road. Public access is generally restricted in this area by private land but there are moderate opportunities for walking, hiking, riding and wildlife viewing (moose and deer). At node C, where the route begins its descent towards the Fraser, an interesting ridge provides excellent views of the Fraser Canyon. There are no parks, reserves or recreation facilities in this section.

Visual and recreation impact potential is low as 5L46 would parallel the eastern edge of four existing transmission lines (2L90, 2L91, 5L41, 5L42) resulting in only modest incremental visual effect.

Section CE

The Fraser River flows through a gorge approximately 1,000 m deep which is a highly distinctive landscape feature with dry, sparsely vegetated and gullied valley sides. The area provides for superior landscape viewing, wildlife observation and nature study opportunities. Both the BC Rail line and Highway 12 overlook this area. Rafting is a significant use on the river. Views from the river, highway and railway are significantly impaired by 5L42.

As 5L46 would parallel the southern and eastern edges of this existing ROW in this section, incremental visual impacts at this crossing are judged to be only moderate; impact potential between Slok and Lee creeks west of the Fraser River is low.

Fraser (CDE) Suboption

Biophysical and landscape characteristics of suboption CDE are nearly identical to those described for section CE. The only difference is that the suboption CDE entails crossing more cultivated benchlands adjacent to the canyon, and two crossings of Highway 12 and a crossing of 5L41 and 2L90/91 in a highly exposed location. This crossing of the Fraser would be much more visible from the river, highway and railway than the CE crossing. Potential visual impacts are judged to be severe along suboption CDE. Relative impacts are greater in suboption CDE compared to the section CE mainly because the CDE route represents new impacts while impacts in section CE are incremental.

Visual impact potential is severe at the Fraser crossing and high on the benchlands north of Lee Creek where a new ROW would be required.

Section EF

Section EF occupies steep, forested terrain between Lee Creek and the Bridge River. Vegetation is predominantly closed-canopy coniferous forest along with some sections of partially open forest. There are no parks or reserves along the route but the visual qualities are high when viewed from Highway 12 and the BC Rail line. The historic West Bank Trail parallels 5L42 along the west side of the Fraser.

There are attractive visual qualities and very high recreation features for a small area at the mouth of the Bridge River where it flows through a shallow, rock-walled canyon before its green waters meet the contrasting Fraser River waters. This is an outstanding location to view migrating salmon runs as well as to watch the traditional native harvest of salmon during the summer and early fall.

The major areas of importance along the lower Bridge River are remote from the Bridge River crossing; 5L46 would be adjacent to the 5L42 ROW in this section thus presenting relatively low incremental impact potential.

Impact potential of 5L46 upon recreation and visual resources is moderate in section EF.

TABLE V-2

IMPACT RATING DERIVATION GUIDELINES

ASSESSMENT FACTOR	COMBINATION OF ASSESSMENT FACTORS TO PRODUCE IMPACT RATING			
Resource Quality	High	Moderate-High	Moderate	Low-Moderate
Resource Sensitivity	High	High	Low	Low
Existing Use or Visibility	High	Moderate-High	Moderate	Low
Relative Change in Conditions	High	Moderate-High	Moderate	Low
ASSIGNED RATING	SEVERE	HIGH	MODERATE	LOW

ANTOINE (BG) - 44.3 KM

Except at the crossings of the Fraser and Bridge rivers, landscape and recreation qualities are generally low along the Antoine (BG) segment. Away from the crossings, the route traverses hilly to mountainous terrain. Vegetation varies from closed-canopied forests to more open forest cover depending upon aspect and local moisture conditions. Where closed forests normally prevail, logging has taken place, such as between Slok Hill and McKay Creek and between the Bridge River and Mission Ridge. There is considerable topographic variety along Antoine Creek which combined with the dry conditions provides a rugged stark wilderness landscape. Minor elements of subalpine forest are found in the vicinity of Slok Hill.

At the Fraser crossing, there is a dramatic, dry, almost treeless gorge. Eroding bluffs about 200 m high are immediately adjacent to the river while successive slopes and benchlands rise a further 1,000 m to form the main valley. High quality landscape views are obtained both from the river's surface and from adjacent slopes and benchlands. This area also has significant wildlife viewing opportunities, especially for mountain sheep, deer and birds of prey. 5L46 would remove the sense of isolation at the remote Kelly Creek IR 3 beside the Fraser.

There is attractive landscape viewing at the Bridge River crossing and immediatley to the west the Bridge River Road climbs and switches back on itself from where there are two distinctive viewpoints. One provides a view to the west overlooking a striking bluff in an arc of the river - the dramatic "Camelsfoot Bend". The other provides a view to the southeast towards the route and its crossing of the Bridge River. From here, the river is observed in a shallow canyon flanked by rolling terrain with dry, open coniferous forest.

There are no parks along segment BG and recreation use is low in the upland areas. Major activities are rafting trips down the Fraser, pleasure driving along the Bridge River road and hunting in the McKay Creek and Mission Ridge areas. An elongated UREP is found along the lower 3 km of Antoine Creek. Antoine Creek valley has high potential for designation as a wilderness by the MOF because of poor access and limited commercial forest. It is recognized by the Ministry as a candidate for study representing the semi-dry interior zone (Vold, pers. comm.).

For the most part, visual and recreation impacts would be low along segment BG. High visual impact would be expected at the Fraser crossing, a significant canyon with little evidence of human activity which is utilized for river rafting. High visual impacts would also occur at the Bridge River crossing, as the route would be clearly visible from the Bridge River Road, both where it crosses the river and where it traverses rising terrain southward for up to 5 km into the distance. Moderate impact potential is assessed for Antoine Creek Valley.

The overall impact potential in segment FG is rated as moderate for recreation and high for aesthetics.

MISSION (FG) - 15.0 KM

The mountainous Mission (FG) segment parallels 5L42 rising to the crest of Mission Ridge. The natural vegetation is relatively monotonous coniferous forest cover. There are several large clear cuts to the west while areas of selective logging and smaller clear cuts are found along the remainder of the route.

Parts of segment FG have moderately significant recreation features. The summits of Mission Ridge lie about 2 km south of 5L42; they feature attractive alpine and subalpine terrain with opportunities for hiking, wilderness travel and viewing. There are also modest mountain goat and deer viewing opportunities, especially at the highest elevations. The most attractive landscape unit is found in association with a series of small tarns between upper Moon Creek and 5L42 south of Camoo Creek. This area is central to a fairly large, circular UREP. A rough road along Camoo Creek provides access to Mission Ridge. The general area has several back roads which attract off-road vehicle use and hunters. The Moon Lake trail is used by hikers on their way to adjacent such as Mount McLean.

Both recreation and aesthetic impact potential along segment FG is assessed as low as the route would be adjacent to the south side of 5L42 and impacts upon visual quality, recreation resources or existing use would be incremental.

DUFFEY (FJ) - 89.0 KM

The Duffey (FJ) segment between Lillooet and the vicinity of Mount Currie comprises seven sections of distinct landscape types of relatively high visual and recreational quality: Lillooet-Seton River; lower Cayoosh Valley; upper Cayoosh Valley; Duffey Lake; Cayoosh Pass; Joffre Creek; and the Mount Currie Indian Reserve. Excluding the Mount Currie and Lillooet sections, segment FJ presently has no transmission lines and is becoming a significant tourism and recreation corridor.

In segment FJ, the overall impact potential is assessed as high for recreation and severe for aesthetics.

Lillooet-Seton River Section

Landscape and recreational qualities vary from low to high in this section. Between Node F and the north edge of Seton River Valley, the landscape is characterised by relatively steep hillsides of open coniferous forest overlooking Lillooet and its surroundings. There are no formal parks and recreation opportunities are mainly limited to pursuits such as hiking and riding. Although landscapes and recreational qualities on these hillsides are modest, they are in close proximity to Lillooet and to the two highways which parallel the Fraser River and the BC Rail line. Where the route crosses the Seton River Valley, landscape and recreation qualities are relatively high. Major features include interesting rock bluffs enclosing the valley, numerous historic and archaeological attractions and salmon runs. Seton Lake offers good opportunities for boating, water skiing, swimming, picnicking and fishing. The lake is operated as a reservoir with a relatively minor 0.6 m maximum draw-down. A dam, powerhouse, fish ladders and spawning channels are interesting man-made attractions.

BC Hydro manages a major recreation area occupying about 50 ha between Seton Lake, Seton River and lower Cayoosh Creek - the Seton Lake Recreation Area. Facilities include a 29-unit campground, a short trail system with interpretive signs, a developed beach, picnic areas, parking and a road-side viewpoint. There are other vantage points and pull-outs overlooking this area from the Duffey Lake road as it begins its ascent into Cayoosh Canyon.

Impacts of 5L46 in this section would be high: high visual impacts would be expected on the side hills north of the Seton River around Lillooet where landscape and recreation qualities are not high and the open forests are only moderately sensitive to visual impact. Also, the route would be adjacent to 2L90/91. However, these slopes are very exposed to the residents of Lillooet and nearby highway travellers.

At Seton River, visual and recreation impact potential is high, as the route would occupy a highly exposed position on bluffs both on the north and south sides of the valley. It would be in full view from much of the BC Hydro Recreation Area and from nearby points along the highway and throughout the adjacent valley.

Net visual impact potential is judged to be high for the Lillooet to Seton River Section.

Lower Cayoosh Valley Section

This section refers to the 10 km of Cayoosh Creek valley downstream from Cinnamon Creek, which is largely enclosed by dramatic rocks bluffs or canyons providing high quality views from along the Duffey Lake road. Local relief exceeds 1,500 m in some areas adjacent to the creek. Several waterfalls can be observed where tributary creeks enter the main valley.

There are no formal recreation sites in this section, only a small UREP near Phair Creek. However, there are numerous vantage points adjacent to the road and there is excellent potential to develop further view points and interpretation of natural history and geologic themes along this increasingly important tourist corridor. The visual impact potential in this zone is severe; 5L46 would require the placement of towers at silhouetted, sky-line locations or on highly exposed forested slopes adjacent to the road.

The high visual quality would be severely compromised along increasingly important travel corridor in the Lower Cayoosh valley.

Upper Cayoosh Valley Section

This section refers to the Cayoosh Creek valley from Cinnamon Creek to the vicinity of Duffey Lake. Except for a small canyon near Gott Creek, Cayoosh Creek occupies a level alluvial plain averaging 500 m width which is enclosed by forested and rocky hillsides. There are excellent opportunities for camping, viewing, hiking, fishing and hunting. Secondary roads provide access to nearby high elevation areas with high quality opportunities for wildlife viewing and alpine hiking. There are five MOF recreation sites in this section, two of which occupy UREP land. There are also two other undeveloped UREP's along the valley floor.

Although certain north-facing slopes have been logged, the valley presents a largely undisturbed landscape. At two of the recreation sites, 5L46 would be almost directly overhead and would be fairly obvious from numerous portions of the main road. Also, it is located on the southeast side of the valley where the closed forest canopy is most sensitive to visual disturbance.

Visual and recreation impact potential in the upper Cayoosh section is high.

Duffey Lake Section

Duffey Lake, mid-way between Pemberton and Lillooet, is a major attraction along segment FJ; it has a highly scenic setting and provides good opportunities for fishing and boating. Attractive avalanche tracks and mountain summits along the north side of the lake are seen from the road along the south shore. The southern slopes feature closed forest cover with large cutblocks in several locations.

There is a small MOF recreation site at the east end of the lake, designed mainly as a boat launching point, but also used for overnight camping. The MOP has a proposal for a 24 ha, Class A park at the southwest end of the lake. This is anticipated as a camping and day-use park for boating, swimming and fishing. It would also serve as a staging area for hiking into the adjacent mountains which have excellent alpine features and wildlife viewing opportunities.

For the most part, the route would be screened from the road and lake and the proposed park if existing vegetation adjacent to the highway and the lake is maintained. The main areas where 5L46 would be visible would be from along the road where it skirts clear-cuts near the southwest and central portions of the lake from where it would be viewed in an already modified landscape.
The recreation and visual impacts of 5L46 at Duffey Lake would be moderate.

Cayoosh Pass Section

Between Duffey Lake and Cayoosh Pass, Cayoosh Creek occupies a relatively wide valley. From the road there are numerous vantage points offering broad vistas of the foreground valley along with distinctive peaks and summits on the skyline. The most impressive views are generally towards the Joffre Mountain group to the southwest. Extensive areas in this section have been logged - ironically, the clear-cuts contribute to the opportunity to observe the more distant mountains. There are no parks or reserves in this section; except for landscape viewing in the valley, recreation opportunities are limited mainly to hunting.

Much of the landscape has already been modified by logging but towers and lines would impact upon the superior landscape views; the best vistas are towards the southwest from the road on the north side of the valley from which the route on the south side of the valley would be in direct line-of-sight.

The impact potential of 5L46 is expected to be moderate in the Cayoosh Pass section.

Joffre Creek Section

The Joffre Creek section between Cayoosh Pass and the north end of Lillooet Lake is approximately 10 km long. Except for a few site-specific areas, this section generally has low landscape and recreation qualities. Closed forests alternating with clear cuts prevail and the confined nature of the valley mostly limits landscape viewing opportunities. There is, however, one excellent vantage point on the road providing a view towards the west.

A highly important area is found at the head of the valley. Until recently, Lower Joffre Lake immediately south of the Duffey Lake road was a MOF site used primarily as a parking lot and as a starting point for the Joffre Lakes trail. This site is now part of a 1,460 ha Ministry of Parks Recreation Area extending southward to include Mount Spetch and Joffre Peak - an outstanding area of dramatic peaks, glaciers, alpine terrain and cirque lakes. There are excellent opportunities for hiking and mountain climbing. Presently, a 3 km trail is the only facility but there are plans to establish more trails and a series of primitive campsites. If existing mineral claims in the area lapse it is proposed that the area become a Class A park. A MOF recreation site was located at the mouth of Joffre Creek on Lillooet Lake, but it is now inactive.

There are two areas where impact would be moderate: very close to Lower Joffre Lake the transmission line would be an unwelcome feature at the north end of the Joffre Lakes Recreation Area; and on the mid-slope overlooking the north end of Lillooet Lake, the route would create a highly visible and contrasting element on the slope which would be clearly visible from the Duffey Lake road and the north end of Lillooet Lake.

The impact potential of 5L46 in the Joffre Creek section is low-moderate.

Mount Currie Section

Landscape and recreation quality in the Mount Currie section is relatively low although it does have an attractive setting because of the surrounding scenic mountains. Terrain is rolling to level with young successional forests and frequent clearings. Small lakes at either end of this section are the main landscape features providing visual diversity. Xit'olacw Lake at the east end borders the Lillooet River delta and provides superior opportunities for bird and salmon run viewing in a variety of wetland habitats. The route is adjacent to 3L2 past the new village.

The impacts of 5L46 upon visual and recreation resources would be low with a small area of moderate impact potential at Xit'olacw Lake; the route is mainly adjacent to an existing ROW where the impacts would be incremental, but the impact adjacent to the village would be high.

ANDERSON (GH) - 39.5 KM

Most of the Anderson (GH) segment lies along Anderson Lake. Landscapes and recreation qualities immediately adjacent to the route are generally of low-moderate quality with only a few site-specific areas of high recreation significance. Topography along the route is generally steep. Vegetation is a mosaic of mixed cover types - patches of closed forest with intervening areas of open forest, shrub cover and bedrock. Logging, old fires and transmission line ROWs contribute to the varied vegetative cover.

Between node G and the Mission Pass road some patches of subalpine forest are encountered at the highest elevations. From these ridges, and particularly from the Mission Pass Road, there are excellent southerly views, overlooking Anderson and Seton lakes. Segment GH bisects a large UREP of approximately 1,100 ha on Mission Ridge. A second, much smaller UREP is located adjacent to the route, and the road near the summit of Mission Pass. The 5L42 ROW and roads provide relatively easy foot access to the ridge tops which in turn provide scenic hiking routes along Mission Ridge and some opportunities to view mountain goat and deer.

The Seton Portage and South Shalalth area is a minor recreation/tourist destination with several attractive features. The area has historic significance as part of a major route to the Interior gold fields in the 19th Century and has a concentration of archaeological sites. BC Hydro generation facilities also hold interest for viewing and interpretation. A major feature of this area is its strategic location between Anderson and Seton lakes both of which provide potential for boating, viewing and fishing. Shorelines at the two lakes in this vicinity have capability for development of resorts and campgrounds accompanied by excellent views down the narrow lake valleys.

At Whitecap Creek there is a small canyon and an attractive waterfall a short distance from the community of Seton Portage. Seton Portage Historic Provincial Park is located near the lower end of this canyon parallel to the Seton River; this is a small Class A park which presently has no facilities other than a toilet. However, there is good potential for development of the park for historic interpretation. BC Hydro is currently considering development of a beach and picnic site on the shore of Seton Lake at South Shalalth.

The northwest shore of Anderson Lake is generally steep. However, there are several alluvial fans which appear to be stabilized and with good potential for campsite or cottage development. Most beaches along the lake are on these fans. The "highline" road serving the existing transmission lines provides rough access between D'Arcy and Seton Portage and is used for access to recreation properties and for 4-wheel drive touring and hunting access and provides wildlife viewing opportunities.

A significant recreational trail leads westward up McGillivray Creek through to upper Cadwallader Creek and Bralorne. This is an attractive route for summer hiking and leads to an excellent cross-country skiing area.

D'Arcy presently represents the terminus for most road travellers from the south. Similar to Seton Portage, D'Arcy has historic significance and potential for development of recreation sites, camping and resorts - a small resort currently caters to summer tourists. Nearby features include an attractive beach on Anderson Lake, small wetlands, fish hatchery, man-made spawning beds and close access to Birkenhead Lake Provincial Park.

Moderate visual impacts are expected at the northeast end of Anderson Lake where the route leaves 5L42 and descends to reach the 2L1 ROW. This would create a new ROW of which about 1 km would be readily visible from the northeast end of Anderson Lake, its shoreline and properties along the adjacent backshore. The existing vegetation cover would help mask the new ROW because the existing forest is relatively open and scattered and the hillside has several clearings in the form of bedrock exposures and an old burn.

Although landscape and recreation qualities are moderate-high along segment GH, only low impacts are expected from 5L46 along most of the segment. Along Anderson Lake, 5L46 would replace 2L1 resulting in negligible increased impacts in a corridor with three other transmission lines. North and east of Seton Portage the route would be adjacent to 5L42 and impacts are similarly expected to be low. Removal of 2L1 through Seton Portage and D'Arcy would be a visual benefit.

The overall impact potential in segment GH is assessed as low for recreation and moderate for aesthetics.

BIRKENHEAD (HI) - 20.0 KM

The first 7 km of the Birkenhead (HI) segment are occupied by Blackwater Creek and Blackwater Lake. For the most part, this section is a narrow valley with steep, heavily forested hillsides. An intervening 6 km valley between Blackwater and Birkenhead lakes is relatively broad. Much of this area has been cleared for agriculture and there are good landscape views from the Birkenhead Lake Park road, especially towards the west.

Blackwater Lake, about 15 ha in size, is mainly used for fishing. An MOF recreation site provides about 10 campsite spaces and access to the water for small boats. Attractive wetlands are found along the shore of the lake, especially at its southeast end where there are good opportunities for bird watching and nature study. Birkenhead Lake is the major attraction of segment HI. It is reached by road either from the east to a provincial campsite at the northeast end or from the south to its southwest end. A rough road along the northwest side of the lake connects the two roads but it does not appear to be open to the public. Birkenhead Lake is a narrow 6 km water body with clear, green water; it is bounded by scenic mountainous terrain and offers excellent opportunities for fishing, boating and viewing. Except for a small area to the southwest, the lake and surrounding mountains form Birkenhead Lake Provincial Park which has an area of 3,642 ha. Park facilities include a 105-unit campground, boat launch ramp, a short trail system, day-use area and a 305 m developed sand beach. The southwest end of the lake is developed as a recreation cottage area. A third area with potential for camping and beach development is found at a large fan along the north side of the lake at the mouth of Sockeye Creek.

A major distinction of Birkenhead Lake Provincial Park is its relatively undeveloped state and highly attractive setting. The route through the continuous closed canopy forest on the uniform slopes along the lake would very seriously impact upon these qualities. Visual impact potential is also high at the cottage area at the southwest end of the lake which would have direct views towards the route on the forested slopes. The section between Birkenhead and Blackwater lakes is an attractive viewing corridor and approach to the Provincial park where visual impacts would be high. Southeast of Blackwater Lake anticipated impacts would only be moderate as the route would be generally out of sight from along the road in this area.

The overall recreation and aesthetic impact potential in segment HI is assessed as severe.

GATES (HJ) - 27.5 KM

The Gates (HJ) segment follows a narrow, steep-sided valley where the existing road, railway and transmission lines (5L42, 3L2, 2L2 and 2L1) create relatively congested conditions. The transmission lines tend to be highly visible from the road, railway and residences in the valley. The importance of this corridor as a developing tourist route means that special attention to minimize visual impacts would be required both for the existing lines, the removal of 2L1 and the addition of 5L46.

The transportation and utility corridors, combined with varied land use patterns, result in highly varied vegetation units along the valley bottom. Dense deciduous forests, open stands of pine, meadows and small wetlands alternate with rock outcrops. The adjacent steep hillsides also feature varied vegetative cover. North facing slopes south and east of the route tend to be comprised of closed-canopied coniferous forests. However, old logging and fires have resulted in frequent deciduous patches. South facing slopes such as at Gates Lake are more open as a result of avalanches, drier soil conditions and bedrock exposures.

A major attraction of the valley is Gates Lake which offers opportunities for viewing, fishing, small boats, swimming and windsurfing. There are two resorts on the lake catering mainly to summer tourists. There are no public parks at the lake, although a small UREP is on the south shore and is used mainly by local residents. Two other UREP's are found along segment HJ; a small one about 1 km west of Gates Lake; and another of about 200 ha along the Birkenhead River at Owl Creek. A medium-sized MOF recreation site is located at the mouth of Spetch Creek.

There are good opportunities for nature study and wildlife viewing along segment HJ. Interesting transitions between the wet Coastal and the dry Interior ecosystems are readily observed. There are good populations of deer and bear throughout and the Birkenhead River offers good angling and fish run observation opportunities.

In the Gates Valley, the railway provided the initial access. Early settlement and transmission line construction was generally close to the railway which has resulted in congestion along the narrow valley floor.

For the northeastern portion of segment HJ (node H to west of Gates Lake), the route largely diverges from existing transmission lines or ROW to reduce visual impact. Net visual and recreation impacts would be moderate. To the southwest - along Poole Creek and the Birkenhead River - the route would mainly utilize the 2L1 ROW. Overall visual and recreation impacts in this section would be low. From node H the route leaves a location adjacent to 5L42 and returns to the 2L1 ROW for a crossing of the valley and highway 2.5 km southwest of node H. Visual impacts would be low along this short section; 5L46 would only be visible where it crosses the road at close to a right angle to the direction of travel. Travellers on the road would only get a brief glimpse of the conductors at a curve in the highway.

From this highway crossing, the route climbs the south side of the valley up a steep slope to almost 500 m above the valley floor. From here, it turns westward and continues along a descending course for about 4 km on the south slopes, crossing gullies, bluffs, scree slopes and forested terrain. Three km east of Gates Lake the route rejoins 5L42. Portions of this section, high on the valley side, would be exposed to view from homes on the north side of the valley and to travellers on the road and railway. This route has been located to take advantage of the varied background of bluffs and scree slopes to reduce visual impact. Impact also would be reduced by not clearing to the bottoms of the deeper gullies along the route. Net visual impact potential is expected to be moderate and may be lower than that for 2L1 which would be removed. Presently, 2L1 lies in the immediate foreground of viewers from homes and the road.

Westward from Eight Mile Creek the route would be located upslope of 5L42, either adjacent to it, or near it, for 5 km passing Gates Lake, then returning to the 2L1 ROW about 2 km west of the lake. Immediately west of Eight Mile Creek the increased width of clearing would have a moderate visual impact on westward views from homes on DL 1250 at a distance of about 1 km. At Gates Lake, 2L1 would be removed from the shoreline and the close proximity of two homes. The new route would also reduce visual impacts for viewers from the two resorts at Gates Lake.

From Poole Creek to node J the route would utilize the 2L1 ROW; this would represent a small incremental change and net visual and recreation impacts would be low. However, there are very congested conditions along this section. If the Anderson Lake area is to develop as a tourist destination it would be beneficial if visual impacts along the road were reduced. BC Hydro intends to explore the opportunity for a new route on the east side of the valley above 5L42 to reduce visual congestion in this section.

The overall impact potential in segment HJ is assessed as low for recreation and moderate for aesthetics.

OWL (IK) - 25.0 KM

The Owl (IK) segment would traverse a variety of terrain types, much of which have high visual quality and important park and recreation potential. The major features of interest are associated with the Owl-Fowl uplands between the Birkenhead and Lillooet rivers which are part of a highly attractive subalpine and alpine area which extends northwestward to the vicinity of Tenquille Lake.

The route crosses a subalpine basin and skirts a series of lakes and tarns which are highly significant landscape units and well established hiking destinations. Access is by way of a rough road and trail route along Owl Creek. A series of basins at varying elevations, separated by interesting rock bluffs, provide a diverse range of recreational landscapes. Nearby features include cirque basins and alpine peaks to the northwest, a major waterfall on Fowl Creek, opportunities for mountain climbing and viewing mountain goat and deer. For several years the MOF has administered trails and primitive camping in the Owl Lake area and it is presently planning trail improvements. Recently, the area has been included in the MOP Mount Ronayne Recreation Area Proposal which encompasses 3,700 ha between upper Owl Creek and Tenquille Lake.

Moderate visual impacts would be expected at the north end of segment IK. Between the southwest end of Birkenhead Lake and Fowl Creek the route would angle across mountainous, forested slopes flanking the Birkenhead River and the access road to the lake. The route would contrast sharply with the forested terrain and would be readily visible from the road. Visual and recreation impacts would be severe in the Owl-Fowl uplands. The route bisects one of the main subalpine basins and is very close to, or crosses, many of the lakes, tarns and hiking routes.

Visual impacts would be mainly high along the remainder of segment IK. In the vicinity of Pemberton, 5L46 would be highly evident where it descends southward into the Pemberton Valley, crosses the valley bottom and along the mountain slopes west of Pemberton and Nairn Falls Provincial Park. Visual and recreation impacts would be severe near node K because the route bisects Nairn Falls Provincial Park and crosses Highway 99 at a highly sensitive location between the park's campground and Nairn Falls.

The overall recreation and aesthetic impact potential in segment IK is assessed as severe.

RYAN (IM) - 57.0 KM

The Ryan (IM) segment passes through the highly significant proposed Mount Ronayne Recreation Area. Between upper Tenas Creek and Ogre Lake the route follows a relatively narrow pass in an attractive setting with excellent opportunities for alpine viewing, hiking and wildlife observation.

Another important area would be the crossing of the Pemberton Valley. Landscape viewing and pleasure touring occur along the valley bottom and near the crossing there is the trail head for Tenquille Lake on the east side of the valley. There is dispersed settlement along the valley floor. In addition, the ridge between the lower Ryan and the Lillooet rivers provides one of the most accessible sites for viewing mountain goat within the region.

Roads along Rutherford Creek and Ryan River provide access for recreation, especially for hunting and wildlife viewing (mountain goat and grizzly bear) and for snowmobiles in winter. A small subalpine unit separating the Ryan/Rutherford drainages provides modest hiking and viewing potential.

An attractive 15 km subalpine/alpine ridge is crossed between Rutherford Creek and the Soo River; it features a variety of readily accessible and attractive landscapes including Krumholtz vegetation, rocky alpine summits and interesting rock spires. A hiking route/trail provides access to the ridge from logging roads along lower Rutherford Creek. Presently, recreation use appears to be relatively low but the ridge has potential for attracting hikers because of its variety of landscapes and scenic features. Westward, the ridge leads to an area of very rugged mountain and glacier terrain between upper Rutherford Creek and the Elaho River which is an important area for snowmobilers. The route crosses the Soo River near node M , at or very close to, a waterfall and MOF recreation reserve at the west end of the Soo River wetlands.

Severe visual impacts would occur in the narrow pass at Ogre Lake. High visual impacts would occur at the crossing of the Pemberton Valley and on the adjacent valley sides, especially to the west where steep slopes and a closed forest canopy would be very sensitive to modification. High visual and recreation impacts are anticipated at the ridge north of at the Soo River.

Elsewhere along segment IM, visual and recreation impacts would be moderate. These areas include lower Tenas Creek, the Ryan River corridor and Rutherford Creek valley where recreation and scenic values tend to be less significant. As well, extensive logging in the Rutherford and Ryan valleys would tend to mask the visual impact of 5L46.

The overall recreation and aesthetic impact potential along segment IM is assessed as severe because of the high landscape qualities, recreation opportunities and park potential.

PEMBERTON (JK) - 10.0 KM

The Lillooet River and Pemberton Valley are the main physiographic features of the Pemberton (JK) segment. Cleared fields and cultivated lands in the main valley provide high quality vistas along the valley and towards adjacent mountain summits, especially Mount Currie which dominates the landscape. Visual qualities are further enhanced by the presence of the Green River, several sloughs and small lakes; this is a large scale landscape capable of accommodating visual modification with only modest impact potential. There are several high quality recreation features along segment JK: the lower Green River for viewing, nature study and fishing; One Mile Lake for picnicking, swimming, bird watching and nature study; Mosquito and Ivey lakes for fishing and swimming; fish run viewing along the Lillooet River, especially where clear waters prevail near tributary streams; and historic and cultural features at Pemberton. One Mile Lake Park immediately south of Pemberton is a heavily used, road-side park administered by Pemberton which caters primarily to day-use activities such as picnicking and swimming. At its northern end the lake features an attractive marsh with board-walks for bird watching and nature appreciation.

The northeast end of Nairn Falls Provincial Park lies within segment JK. The major natural attractions are Nairn Falls (actually in segment KL) and the Green River. The park has an 88-unit campground, small day-use area and 2 km of trails along the river to Nairn Falls. To the north, Mosquito Lake lies within a small UREP and has a small MOF recreation site on its south shore. Access to this site is via a gravel road from the highway near Owl Creek. Two small MOF recreation sites are found at the mouth of Owl Creek.

The major concern is at Nairn Falls Provincial Park where a widened ROW would be required through the park. However, the widened ROW would be east of the campground and away from the existing major use areas between the campsites and Nairn Falls. Furthermore, 2L1 would be removed from its very unfavourable location along Highway 99 and the entrance to the park. The net impact potential is considered to be moderate.

Elsewhere, net impact potential is low. 5L46 would parallel the western edge of the existing 5L42 line representing a low incremental impact. The major concern visually is at Signal Hill which is an important foreground for views of Mount Currie from the highway and Pemberton. This adverse impact would be offset by the removal of 2L1 for 7 km north of node K. In this section 2L1 is adjacent to Highway 99 for 3.5 km, is adjacent to One Mile Lake Park and crosses settled areas on the fringes of Pemberton for 3.5 km. The new route would have significantly less visual impact.

In segment JK the overall impact potential is moderate for recreation and low for aesthetics.

GREEN (KL) - 2.0 KM

The short Green (KL) segment parallels the southeast side of Nairn Falls Provincial Park and the Green River. One exception would be where the route would descend a hill for about .5 km just before it meets node L. Observers looking southeast from the highway and railway near the railroad overpass would see 5L46 at this point. 2L1 would be removed in this segment for 2 km along Highway 99 and at the entrance to Nairn Falls Provincial Park; this would be a major improvement in visual terms for highway travellers and park users.

Recreation and aesthetic impact potential in segment KL is low for the route would largely be out of sight from the highway and the park.

SOO (LM) - 18.0 KM

The major landscape feature in the Soo (LM) segment is the wetland unit extending for about 7 km along the lower Soo River which is an attractive, broad plain with varied habitats providing good opportunities for landscape viewing, wildlife observation and nature study. There are numerous and extensive clear cuts along the slopes adjacent to the valley and the surrounding landscape has been extensively modified.

A trail enters the valley from the vicinity of Showh Lakes and continues westward along the valley. The MOF has a recreation reserve at each end of the wetlands which appear to be inactive sites which may be developed in the future. The westerly site is at a small waterfall on the Soo River. Existing recreation use in the Soo River valley is relatively low. However, the valley has potential for cross-country skiing and mechanised recreation on the logging roads.

Near the confluence of the Soo and Green river valleys there are a series of interesting rock bluffs which are visually distinctive and are used for rock climbing. Immediately north of the bluffs there is a small MOF recreation site at a small lake with road access from Rutherford Creek. This general area is used for deer hunting. Recreation and landscape values are modest and much of the route has already experienced considerable modification from logging. However, small areas of high visual impacts would occur for about 3 km southwest from node L adjacent to Highway 99. Both east and west of the highway, the route would be highly visible where it descends a hill from the northeast and ascends the slope to the southwest. Also, 2L1 would be removed from its location adjacent to the highway in this vicinity but it would be replaced by 5L46 which may cross the highway diagonally to the direction of travel.

Elsewhere, segment LM would not be visible from Highway 99. However, visual and recreation impacts would be moderate because of potential interference with climbing and hiking opportunities and natural features adjacent to the Soo River.

The overall recreation and aesthetic impact potential along the segment LM is moderate.

WHISTLER (LN) - 37.0 KM

The Whistler area has the largest concentration of developed recreation and tourism resources in B.C. except for Vancouver and Victoria. At Whistler there are approximately 60 hotels, lodges or condominiums, a dozen municipal parks, numerous commercial recreation enterprises and an extensive trail system. Currently, the tourism and recreation infrastructure is experiencing rapid growth: winter and snow related recreation activities remain the major attraction but non-winter opportunities are growing in importance. There is a concerted effort by the resort industry and local government to balance the tourism economy by increasing summer and shoulder season use.

Certain on-going studies and existing plans have pertinence to the visual and recreation implications of transmission lines in the Whistler area. The Whistler Local Resource Use Plan was initiated in 1980 by the MOF and the Whistler to address public concerns over forestry operations on recreation and visual values. This study was expanded by the MOF in late 1989 with the initiation of the Sea-To-Sky Highway Corridor Local Resource Use Plan which includes the highway corridor from Howe Sound to Cayoosh Pass.

A major product of the Local Resource Use Plan is a 1:50,000 landscape inventory which identifies scenic influence zones, key viewpoints, sensitivity ratings and visual quality objectives. Maps are available covering the area from north of Green Lake to Daisy Lake which are general in nature and are designed primarily to reduce the visual impact of logging. The route through Whistler is almost entirely within the most sensitive scenic influence zone as identified on the maps.

Another document is Whistler's Recreation Master Plan. It identifies key recreation areas and parks and numerous development and enhancement opportunities which are concentrated along the valley floor between the north end of Green Lake and where the Cheakamus River enters the main valley near Function Junction. The Ministry of Crown Lands is presently undertaking a review of potential commercial recreation in the Whistler/Pemberton backcountry. No conclusions are yet available, except that the Rutherford and Callaghan creek valleys are identified as important access routes.

Segment LN is sub-divided into three sections for this discussion: north of Green Lake; Green Lake to Function Junction; and Function Junction to Daisy Lake; impact potential evaluations are given for each section.

The overall impact potential in segment LN which considers all of the factors in the three sections is judged to be low for recreation and moderate for aesthetics.

North of Green Lake

For the most part, the section north of Green Lake has low-moderate visual and recreation impact potential: landscape and recreation values are of moderate quality. Three transmission lines (2L1, 2L2 and 5L42), Highway 99, BC Rail and several gravel pits occupy the bottom of the Green River valley while the adjacent slopes have either been extensively logged or burned. There are no formal parks or recreation sites, and away from the highway, present recreation use appears to be low.

There is good capability for camping and hiking along Green River, and modest opportunities for fishing, especially north of Mystery Creek. Upstream from Mystery Creek, the valley narrows, partly as a result of an interesting old slide which holds interpretive value. In the upper section of the valley a series of rapids and chutes have some scenic value. As described for segment LM, rock bluffs at the entrance of the Soo River Valley are used for climbing and are a visual focus from Highway 99.

For approximately 2.5 km south from node L the route would utilize a new ROW with moderate visual impact potential because of the visibility to northbound travellers. In this section 2L1, which is frequently adjacent to the highway, would be removed which would result in some visual improvement although 2L2 and 5L42 lines would remain in close proximity to the road. A new ROW on a hillside to the east would be variously prominent or hidden from the highway depending upon local topographic conditions. The impact potential may be reduced by vegetation or topographic screening; also, it would be viewed at right angles to the direction of highway travel.

Southward from the above described section the remainder of the section north of Green Lake has low visual and recreation impact potential. Between 2.5 and 7 km south of node L the route would parallel 5L42; only small proportions of which are visible from the highway and the net increase in visual impacts is expected to be low. A distinct benefit would be the removal of 2L1 which is prominent along 5 km of Highway 99 in this section. From a point about 7 km south of node L to the north end of Green Lake, the route would occupy the 2L1 ROW. In this area the route crosses lower portions of the Wedgemount Glacier and Lost Lake trails. Only a small, incremental impact is expected in this area.

Green Lake to Function Junction

This section contains the most complex array of visual and recreation issues within the Study Area. Existing natural features, recreation facilities, parks, opportunities and activity areas are highly important and diverse and have continuing growth and development potential.

In addition to excellent winter-sports, Whistler has several attractive lakes, streams, marshlands and varied landscapes. The area is also central to significant alpine terrain offering good opportunities for summer skiing, hiking, viewing and wilderness travel both in winter and summer. To date, recreation development has focused on the Whistler and Blackcomb ski operations and the valley floor between Green and Alpha lakes. However, important recreational and visual assets extend into the nearby mountains, especially at Rainbow Mountain to the west and Garibaldi Provincial Park to the east.

In the vicinity of Whistler there are numerous high quality recreation opportunities including: skiing, snowmobiling, hiking, mountain biking, riding, swimming, sailing, wind surfing, fishing, wildlife observation, nature study, viewing and photography. The alpine ski operations attract and sustain the greatest use. However, numerous parks, commercial enterprises, trails and sites along the valley floor also receive heavy use. In addition, the region has become important for special events such as international ski competitions, races, and triathalons.

Several dozen parks, park development proposals and recreation facilities extend along the valley corridor which includes the extensive Valley Trail system important for hiking, biking and cross-country pursuits. Several wilderness trails originate from the valley including the Wedgemount Glacier, Lost Lake (Wedge Creek), Fitzsimmons, Whistler, Cheakamus and Black Tusk leading south and east and Sixteen Mile, Rainbow Lake and Mount Sproatt leading north and west.

Generally, the route through this section would either be located on the 2L1 ROW or on a new ROW in an improved location. The valley has experienced considerable modification due to the highway, railroad, transmission lines, commercial, recreational and residential development. Normally, replacement of 2L1 with a 500 kV line in such an environment would pose relatively minor visual and recreation concerns. However, Whistler features such an extensive concentration of recreation and tourism activities and facilities that the area is highly sensitive to any disturbance.

There are both general visual and specific recreational and natural feature potential impacts in this section:

- Visual Impacts - Visual impacts from the north end of Green Lake to the north end of Alta Lake are expected to be low. Along Green Lake the route is along a new ROW for about 2.5 km to move away from the shore. Major vantage-points towards this section are from the highway along Green Lake and from subdivisions west of the highway such as Emerald Estates. There are excellent vistas across the lake towards Wedge Mountain area summits. The transmission lines traverse the view but are seen against the varied background of rock outcrops, clearings, natural openings and undulating terrain. The transmission lines are most obvious near the shoreline. The route would also be unobtrusive provided that towers are not silhouetted against the sky.

  Elsewhere, north of Alta Lake, the route would utilize the 2L1 ROW with minor incremental visual impact potential, due to larger tower size and heavier conductors including at Tapley's Farm subdivision, for 2L1 is the middle of the three existing lines and no further clearing is required.

  Moderate visual impacts are expected where the route follows the 2L1 ROW as it parallels the west side of Alta Lake. This section is probably the most heavily viewed area between Kelly Lake and Cheekye. The major ski areas on Whistler and Blackcomb mountains, park areas along Alta Lake and major residential areas in the valley all provide overviews of this section. This is an important view for both residents and visitors. The vista rises from the valley floor to Sproatt Mountain and 2L1 is partially concealed against a background of rocky, logged areas. The ROW is the most visible element in winter while the conductors and towers are more obvious in the summer. For 5L46 the wood pole structures would be replaced by higher steel towers; the conductors would be more visible than the ROW. The main focus of westward views is the skyline of Sproatt Mountain and net visual impacts of 5L46 at the lower elevations would be relatively low along Alta Lake as the route diverges from the 2L1 ROW to run west of a knoll where it is hidden from view from the east. The transmission lines which are most readily seen in this view are 2L2 and 5L42 close to Alta Lake. Severe impact may occur north west of Alta Lake where there is an angle in the 2L1 ROW as extra clearing for 5L46 might expose the ROW to the adjacent houses. It would be preferable to retain a screen of trees.

  West of Nita Lake the route would occupy a new ROW for 2 km where high visual impacts are anticipated. There are three general directions from which this ROW section might be viewed:

  - West from the Whistler and Blackcomb mountain slopes: the route would be partly visible at a distance of 3-6 km.
  - North-west from the valley bottom at Nita and Alpha Lakes: the route generally would be screened from view at these locations by local topographic features.
  - North from the valley bottom and Highway 99 between the Whistler Museum and Alpha Lake: the route would be visible from some portions of the highway as it descends a forested slope. The visual impact at the highway crossing would be high as a double ROW.

  Southwest of Alpha Creek and past the garbage dump the route would parallel 5L42. In this section, visual impacts would be moderate. The route would cross a wetland unit along Miller Creek; Highway 99 on its approach to Whistler from the southwest; and the Cheakamus River between the sewage plant and two residences. The view from these residences would be further impaired by 5L46 as clearing for it would also expose more of 5L42.

- Site-specific Impacts - The main potential site-specific impacts are related to crossings of, or transmission line proximity to, existing parks and facilities, to important natural features and to potential recreation development areas; from north to south these are:

  - potential development of trails along the east side of Green Lake; the transmission line ROW access road is used by snowmobilers and skiers;
  - the Valley Trail along lower Fitzsimmons Creek;
  - Balsam Park playground;
  - Valley Trail at the River of Golden Dreams and the Whistler Cay area;
  - kayaking and river trips along the River of Golden Dreams between Alta and Green lakes;
  - wetlands and nature appreciation opportunities at the north end of Alta Lake;
  - proposed enhancement and development at the north end of Alta Lake including the lower sections of the twenty-one Mile Creek/Rainbow Lake Trail and proposed development of Lot 2110 as a major heritage and waterfront park;
  - development of a trail system, west side of Alta Lake;
  - lower portion of Mount Sproatt Trail;
  - ATV use area southwest of Sproatt Creek;
  - start of the Cheakamus River/Lake and Black Tusk microwave tower trails,
  - possible development of kayaking activities and related parking lot on the Cheakamus River;
  - snowmobile activity south of the Cheakamus River.

Generally, impacts from segment LN upon the above areas should not be high. Except for the last five instances described above, 2L1 is simply being replaced by 5L46. However, construction activities should be carefully carried out in order not to degrade natural or man-made amenities; towers should be located back from river banks and road crossings to reduce visual impact potential.

Function Junction to Daisy Lake
This section refers to approximately 8 km along the upper Cheakamus River valley to Daisy Lake. There are basically two homogeneous units along this section: a 5 km section of hilly upland terrain; and, to the southwest, a 3 km section where the route crosses a lowland unit containing the Cheakamus River and Daisy Lake.

The upland unit is comprised of rolling terrain. Extensive clear-cuts occur to the north and remnant areas of coniferous forest alternating with rocky terrain appear to the southwest. The varied topography and vegetative and several small water bodies contribute to a moderately interesting landscape with good views towards peaks such as Brandywine Mountain to the northwest. The area has an extensive network of roads which are popular for touring, snowmobiling and cross-country skiing and is considered to be suitable for equestrian activity.

North of Daisy Lake, the Cheakamus River and Brandywine Creek occupy a wide valley with many volcanic deposits. Columnar basalt formations are a striking feature scattered throughout. A significant attraction is Brandywine Falls which flows over a geologically interesting escarpment. Brandywine Falls Provincial Park has a small 15-unit campground, day-use area, hiking trail and cross-country ski trail. North of the park, the valley is occupied by two relatively large UREP's which hold potential for park expansion. Immediately north of the UREP's, between Callaghan Creek and the Cheakamus River, the MOF administer three campgrounds "the Cal-Cheak site" which are heavily used on weekends during summer. Roads southward from these sites form part of a snowmobile and recreation route, which continues southward along the east side of Daisy Lake and connects with the Black Tusk Microwave Tower road-trail. North of the Cal-Cheak site and adjacent to Highway 99 there is a staging area for commercial recreation tours and trips to Callaghan Lake and nearby mountain areas.

Potential visual and recreation impacts are moderate along the Function Junction to Daisy Lake section. In the upland unit terrain and logged areas have good visual absorptive capability. However, 5L46 would require new ROW through lands currently experiencing modest recreation use. Also, this area is judged to be important by the Whistler for future development for horseback riding, bicycling and cross-country activities because such activities closer to Whistler are becoming congested or in conflict with other activities. Jane Lakes are popular fishing spots.

Visual and recreation impacts in the lowland area are also expected to be moderate. A major concern of the MOP is the creation of a new ROW through the eastern arm of Brandywine Falls Provincial park and adjacent UREP. These impacts would be significantly offset by the removal of 2L1 which presently passes through the middle of the park. Removal of 2L1 adjacent to the highway, campsite and main entrance to the park would be a significant visual benefit. In addition, 2L1 would be removed from along other sections of Highway 99 such as at the crossing of Callaghan Creek and for 6 km at the southern approach to Whistler.

In this section the route would only be significantly visible from Highway 99 at the north end of Daisy Lake where it would cross the road at an angle. At this point, northbound travellers could look northeast and see the route crossing Daisy Lake and its descent of the slopes on the distant hillside.

RAINBOW (MN) - 23.0 KM

The Rainbow (MN) segment passes through an area of growing recreation importance. To the north, a series of trails and routes link Alta, Rainbow, Madely and Callaghan lakes. To the south, along lower Callaghan Creek, the route has been extensively logged. There is also an abandoned mine about mid-way along the route. These activities, as well as potential skiing near Callaghan Lake have resulted in good road access for recreationalists throughout much of the Callaghan Creek drainage.

This general area has good opportunities for viewing, wilderness travel, hiking, snowmobiling, cross-country skiing and camping. The Rainbow Mountain area is a relatively easily accessed, high quality alpine unit. Similar terrain continues westward to Callaghan Lake which borders an extensive area of scenic mountains to the north, west and south. Alexander Falls is an attractive feature on a tributary of Callaghan Creek near the Callaghan Lake road.

Recreational use in the area has grown considerably in recent years; the MOF has recorded 3,500 user-visits annually in the Callaghan Lake area (MOP, 1988). Individuals utilize trails in the north and roads in the south to enter the area while businesses catering to groups for a variety of winter recreation activities use the roads and helicopters to access Brandywine Mountain and the Callaghan Lake area. The area is also viewed by MOF and Whistler as serving an important role in future expansion of recreational and tourism opportunities for the Whistler area. This is especially true for the potential growth and marketing of non-winter recreation activities.

The existing roads and trails, a small MOF recreation site at Alexander Falls and an unorganized campsite at Callaghan Lake represent the only present recreation facilities in the area. However, there is considerable interest in establishing parks and additional facilities by Whistler, the MOP and the MOF. A number of reserves and proposals have been put forward including UREP's or recreation reserves at Rainbow Falls, Rainbow Mountain, Showh Lakes, Madely Lake and Callaghan Lake. The Callaghan Creek valley forms an important access route to many recreation opportunities.

The MOP have proposed a 10,000 ha Recreation Area which includes Callaghan Lake, Powder Mountain and Mount Callaghan. The Recreation Area would be developed for vehicle and walk-in camping, hiking and wilderness activities. At the same time, the MOF is continuing to improve and develop the trail system in the Rainbow Mountain area.

The route in segment MN would traverse the eastern part of this increasingly important recreation and tourist area, but would avoid the most attractive landscapes and features. However, it would cross several trails and routes such as the Callaghan Lake road, Madely Lake trail, Brandywine Creek trail and Brew Lake trail. South of Alexander Falls, the route would traverse variously aged clear-cuts where visual impacts would be minimal.

North of Alexander Falls, visual and recreational impacts would be high. The route in this area would contrast sharply with the existing closed forest canopy and it would be visible from important alpine areas in the adjacent mountains. A transmission line would also conflict with the wilderness qualities associated with the area and its growing importance for recreation. To the south, where logging is prevalent, recreation and visual impacts presently is low except for small areas of moderate impact potential where the route would cross recreational trails and access roads; however considering the possible recreational use of the lower Callaghan Valley, the impact potential is upgraded to moderate-high in this area.

The overall impact potential in segment MN is judged to be high for both recreation and aesthetics.

UPPER CHEAKAMUS (NP) - 12.8 KM

Daisy Lake reservoir attracts considerable summer use. BC Hydro has operated camping and day-use facilities along the west side of Daisy Lake at Stanley and Shadow lakes. Concerns about landslide hazards emanating from upper Rubble Creek have resulted in the Provincial Government requiring BC Hydro to close the area to public use. In spite of the closure, the area continues to be used for camping and fishing and BC Hydro is currently considering the establishment of a campground at Stanley Lake. In addition to attractions at the proposed campground, the site is on a well travelled corridor where the future demand for camping warrants the construction of such a facility (Urbanics, 1989). Major attractions of this location are: its proximity to Whistler; a snowmobile and cross-country trail along the east side of Daisy Lake; the Shadow Lake trail system; Tricouni Meadows trail; and Black Tusk Meadows Trail into Garibaldi Provincial Park.

South of Daisy Lake the Cheakamus River is an important recreation corridor above the canyon. It features fishing for Dolly Varden, char, and rainbow trout. The river is also popular for kayaking with Grade II and III runs and sections utilized for white water training and there are commercial raft trips.

Immediately downstream from Daisy Lake, the river occupies a narrow floodplain with moderate capability for camping, hiking and nature appreciation. The adjacent hillsides in this section tend to be moderately sloping with a closed forest canopy. The Cheakamus River enters an interesting canyon 5 km south of Daisy Lake featuring frequent rapids, vertical walls and rock formations which are used for rock climbing. Butterfly Lake near node P has been developed as a cottage area. Further south, towards Culliton Creek, the canyon gives way to gentler topography. The floodplain of the river widens to about 1 km while the adjacent slopes remain steep with frequent rock outcrops.

The Cheakamus Valley is a major travel corridor and provides a scenic gateway to Whistler. Interesting views are obtained from both the railway which hugs the edge of the river and from Highway 99 which mostly occupies bluffs overlooking the valley. One of the most dramatic views is from a highway pull-out in the canyon from which a panorama of the Tantalus Range to the southwest can be seen. There are several other highway pull-outs and view points between Daisy Lake and Cheekye. This section also provides access to several trails leading into Garibaldi Provincial Park, including Black Tusk Meadows, Culliton Creek and the Brohm Ridge trails.

Moderate visual impacts are expected along the first 8 km of segment NP while high visual impacts are expected along the southern 3 km section. A small area of severe visual impact is expected at the highway viewpoint overlooking Cheakamus Canyon and the Tantalus Range as the line might impair the view of the Tantalus Range. The level of these impacts could be reduced by careful route location in this section.

For the first 8 km the route would replace 2L1 with little change in long term visual quality. For the most part, the route in this section would be hidden from view from Highway 99 and the BC Rail line. The only exception is in the vicinity of Pinecrest Lake and Black Tusk Village where residential developments and the road are near the route. Replacement of 2L1 with 5L46 would have a small incremental visual impact at these locations. In this northern section of segment NP, the main concern would be towers in the vicinity of Stanley and Shadow lakes where there are cross-country trails and the proposed BC Hydro campground development; impact potential is assessed as moderate.

For the southern 4 km of segment NP, the route follows a new ROW on the west side of the Cheakamus Valley at elevations up to 400 m above the river; visual impacts upon highway travellers could be high. The route rises up a steep slope on the west side of the Canyon near the "salt sheds", crosses a high ridge, and then descends as it parallels the Cheakamus River over heavily glaciated rocky knolls. Depending upon the final alignment, the route could be highly visible from Highway 99 but opportunities exist to conceal the line by utilizing gullies between the rock bluffs. Visual impacts along Highway 99 would be reduced by removal of 2L1 where it is close to the highway in the canyon.

A third area of concern is at the most significant highway view-point which overlooks the Cheakamus Canyon and the Tantalus Range; it is very difficult to accurately assess how the segment NP route would be perceived from the view-point. Careful examination of topographic maps and air photos combined with field observations suggest that portions of 5L46 would be visible as it descends the slope at node P; if this occurs, then visual impacts would be severe for a short distance.

The overall impact potential in segment NP is assessed as low for recreation and high for aesthetics.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

At present there are no formal parks in the Lower Cheakamus (PQRT) segment. However, there are numerous UREP's mainly adjacent to the Cheakamus River or at several small lakes in the nearby uplands. In the past, some of these were the sites of MOF recreation sites. The most important UREP appears to be the one at Brohm Lake. Currently, the MOF administers a small, but very heavily used recreation site at this location. More than 10,000 visitors annually use this site (MOP, 1989). Because of the high use levels the MOP is now studying the possibility of developing a Class A park at Brohm Lake.

Major features of the Lower Cheakamus River are its reputation for steelhead, winter concentrations of bald eagles feeding on the salmon carcasses, and runs of coho and chinook salmon. It is also popular for kayaking with Grade II and III runs and sections which are used for white water training and there are commercial raft trips. A significant facility along the Cheakamus River is the North Vancouver Outdoor School which has a recreational focus in addition to its educational role. Fergie's Lodge near the mouth of Cheekye Creek has been in operation for several decades catering to fishermen using the Cheakamus River.

The short section between nodes P and Q has moderate-severe visual impact potential. The northern part of this section would be very evident from the important highway viewpoint overlooking Cheakamus Canyon and the Tantalus Range. The southern part of this section would have moderate visual impact. It would be seen by railway travellers and the crossing of the Cheakamus River would be visible from the river.

The section between nodes Q and R has low visual and recreation impact potential because it would involve replacement of 2L1 along the floodplain of the Cheakamus River. The section between nodes R and T has moderate visual and recreation impact potential. It would involve use of the 2L1 ROW along the floodplain of the Cheakamus River, but it passes very close to the North Vancouver Outdoor School.

The overall impact potential in segment PQRT is assessed as low for recreation and high for aesthetics.

West (PR) Suboption - 10.0 KM

This west suboption (PR) is a new route along the 300-500 m contour level on the west side of the lower Cheakamus Valley which has severe visual impact potential that would be partially offset by the removal of 2L1 in the valley bottom. However, the lower route is not visible from the highway while suboption PR would be in full view from the highway and would contrast sharply against the background of closed forest cover. The highway viewpoint overlooking Cheakamus Canyon and the Tantalus Range would provide a very clear view of suboption PR in the mid-ground between the canyon and the distant mountains. Similarly, a highway viewpoint 2 km north of node S would reveal a clear view of the route where it descends towards node R. This impact would be even more evident with the recent reconstruction of the highway north of Brohm Lake. In addition, suboption PR would be seen, although at some distance, from trails and meadow areas in Garibaldi Provincial Park between Clinker and Brohm Ridges.

The overall impact potential in suboption PR is assessed as low for recreation and severe for aesthetics.

East (QS) Suboption - 10.0 KM

The east suboption (QS) is a new route along the ridge crest bordering the east side of the Cheakamus River. Moderate visual impacts are anticipated for the northern 5 km of suboption QS. The route would be seen from along the Cheakamus River. Visual impacts might be high except that the broken terrain and open vegetation would tend to mask the transmission line. Also, use of this route would result in the removal of 2L1 along the floodplain where it is adjacent to the Cheakamus River. For the southern 2.5 km of suboption QS, visual and recreation impacts would be severe. The new route would cut directly in front of a highway viewpoint two km north of node S and it passes within 250 m of Brohm Lake which is a heavily used recreation area and is proposed for Class A Provincial Park status.

The overall impact potential of suboption QS is assessed as high for recreation and severe for aesthetics.

South (RST) Suboption - 6.1 KM

The short section of the south suboption (RST) between nodes R and S has moderate visual impact potential. It would require a crossing of the road and railway along the valley floor. Also, the section rising up a bluff to node S would be visible to kayakers and recreation users in this section of the valley bottom. The remainder of suboption RST to the south has moderate visual and recreation impact potential. It passes through an area which is not readily viewed, is concealed from Brohm Lake and the Cheakamus Valley, and appears to be lightly used for recreation.

The overall impact potential in suboption RST is assessed as low for recreation and moderate for aesthetics.

1990 ALTERNATIVES

ORE (UV) SEGMENT - 38.0 KM

The Ore (UV) segment traverses approximately 38 km of mainly dry, mountainous terrain without parks or recreation reserves. Between node U and Mount Birch the route crosses a series of undulating ridge of relatively low visual quality. Small areas of grassland and open forest are found east of McKay Creek while an extensive area of closed coniferous forest alternating with frequent clear cuts prevails for 16 km west from McKay Creek to Mount Birch. In addition to visual qualities, recreation opportunities are not significant. The major feature is hunting, mainly for moose, and there is potential for touring along the numerous logging roads.

At Mount Birch segment UV skirts a ridge which runs southwest towards Mount Duncan where, at elevations averaging 2,000 m, there are modest opportunities for alpine hiking, viewing and wilderness travel. From Mount Birch, the route descends the Ore Creek drainage, an area with relatively steep topography and variable coniferous forest cover. Visual qualities and recreation significance are generally low along Ore Creek. Some logging has occurred.

From Ore Creek to node V the route crosses, then parallels, the Yalakom River; this is a relatively scenic corridor. The river flows through a narrow gorge up to 150 m deep which is bordered by discontinuous benches, in turn flanked by hillsides which rise abruptly to elevations of 1,500 m. The southwest facing slopes feature attractive parkland forests which are important deer wintering ranges. Extensive selective logging has taken place throughout the more closed forests on the northeast facing slopes. Segment UV crosses the lower portions of a dramatic gorge of the Bridge River with outstanding rock faces, extending upstream to Carpenter Lake. Roads along both the Bridge and Yalakom river valleys provide important recreation access corridors.

Visual and recreation impacts would be low from node U to Mount Birch. Visual quality and recreation significance are low and there is only modest access and use in this section. From Mount Birch to lower reaches of Ore Creek impacts would be moderate. Here, existing use and visibility remains relatively low but the steep slopes and dry landscapes are moderately sensitive to change.

Potentially high visual impacts are anticipated in the Yalakom and Bridge River valleys. This is a relatively scenic corridor with good road access and the intrusion of a transmission line would be very evident. The most significant visual impacts would be the crossings of the Yalakom Valley at Ore Creek and the crossing of the Bridge River near Moha.

In segment F1X, the overall recreation impact potential is assessed as low and the aesthetic impact potential is assessed as high.

BRIDGE (F1X) - 19.7 KM

The Bridge (F1X) segment crosses the southern portion of the Camelsfoot Range, an area of rugged, dry terrain which is readily visible from Highway 12, the BC Rail line and Bridge River Road. The western portions of segment F1X are part of an important deer wintering range and there are good opportunities for wildlife viewing. The southwest facing slopes between Antoine and Applespring creeks feature highly distinctive savanna type forests and grasslands characteristic of dry, Interior landscapes. Consequently, this portion of the route has high significance as a representative landscape and for its ecological characteristics.

Steep topography throughout segment F1X tends to limit recreation capability. However, the highly attractive open forests west of Applespring Creek offer good opportunities for hiking, riding, viewing and nature appreciation.

At the confluence of the Bridge and Fraser rivers, the Camelsfoot Range forms an important landscape and backdrop for viewing particularly from the road and rail routes along the east side of the Fraser. The route parallels 5L42 for 3 kms south of node E before turning to the west at a high elevation up North Blackhill Creek. For a short section at the highest elevations, recreation and visual impacts would be moderate, mainly because this area is lightly used and not readily seen from the major roads.

Where segment F1X begins its descent into Applespring Creek and through to Antoine Creek, severe visual and recreation impacts are anticipated based upon the cumulative effect of: good potential for wildlife viewing; opportunities for hiking, riding, walking and viewing in an extensive, open forest landscape; the importance of the area as a distinctive example of a dry, interior landscape; the high visibility of this area from the Bridge River Road; and the probable use of access roads for construction and their resulting scars.

In segment F1X, the overall recreation impact potential is assessed as high and the aesthetic impact potential is assessed as severe.

EAST (WW1DE) AND SOUTH PAVILION (W1F1) - 20.3 KM

The East (WW1DE) and South (W1F1) Pavilion segments share a common crossing of the Pavilion Creek valley east of Pavilion between nodes W and W1. At node W1, segment WW1DE follows a route mainly westward to node D then utilizes a crossing of the Fraser between nodes D and E. The route follows a more southwesterly direction from node W1, crosses the Fraser 4 km south of East Pavilion to join the Pavilion (BCEF) segment at node F1.

The Pavilion Creek valley is comprised of grasslands and scattered open forest with small areas of cultivation in the valley bottom. The Pavilion Village is a feature on the north side of the valley. To the south, an interesting fan-shaped landslide covers approximately 100 ha. Highway 12 occupies the valley floor. Visual qualities are moderate while there is excellent potential for cultural and historic appreciation associated with the Indian community and viewing the old slide.

Between Pavilion Creek and bluffs overlooking the Fraser both segments WW1DE and W1F1 cross an upland plateau comprised variously of closed forest, mixed deciduous forest, open coniferous forest and meadowlands with good opportunities for hiking, riding, wildlife viewing and hunting. West of node D the impact potential of WW1DE is similar to those of suboption CDE of the Pavilion segment and is rated severe.

Southwest of Tiffin Creek, segment W1F1 enters and crosses the Fraser River valley which is part of a highly distinctive landscape of provincial significance. Dry, sparsely vegetated valley sides lie adjacent to wide benchlands which enclose the deep canyon of the Fraser. The area has superior landscape viewing, wildlife observation and nature study opportunities. Both the BC Rail line and Highway 12 occupy the east side of the valley while rafting is a significant use along the river.

Visual and recreation impact potential is rated high for the Pavilion Creek section shared by both segments WW1DE and W1F1; this section entails a crossing of Highway 12. The crossing of the valley would also be visible from the village of Pavilion which is 1 km west of the route. Visual impact potential of these segments upon the Diamond S homestead area is low-negligible.

Moderate visual and recreation impacts are expected for the upland sections which include the remainder of segment WW1DE and the middle portion of segment W1F1. For the most part, these areas are out of sight of any highway corridors or residents but the segments cross terrain with good opportunities for extensive type recreation activities.

Severe visual impact potential is encountered on segment W1F1 where it crosses the Fraser. This is a very significant landscape where new crossings of Highway 12, the BC Rail line, three transmission lines, the valley and the canyon would be required. In addition, cleared ROW would be created on the steep forested slopes on either side of the valley. The slopes on the west side of the valley as the route approaches node F1 are especially vulnerable to visual impairment due to their steep nature, closed forest canopy and exposure to the highway and railway corridor.

Overall, in segments WW1DE and W1F1, the recreation impact potential is moderate and aesthetic impact potential is severe.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton suboption follows a route which climbs to 1,200 m elevation on a forested slope north of Seton Portage. It appears that most of this route is in an area of low recreation significance and is largely hidden from view from most low elevation vantage points along and between Anderson and Seton lakes.

Visual impact potential is low for the Seton suboption. The high elevation sections are probably out of view from most, if not all, valley bottom locations. Intervening ridges and benches hide the higher elevation sections from the lower areas. At lower elevations southwest of Whitecap Creek the route would be visible in an area already traversed by several transmission lines and representing a portion of the Anderson (GH) Segment.

The overall impact potential in the Seton suboption is assessed as low for both recreation and aesthetics.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

In addition to being an historic settlement, D'Arcy is an important location from a recreation and visual point of view for several reasons: it represents a terminus for most traffic from the south; it has good development potential for camping and resorts and features a small resort, attractive beach, access to Anderson Lake, fish culture facilities; and it is close to the access road to Birkenhead Lake Provincial Park.

The Highline Road along Anderson Lake is another nearby feature which provides recreational and rough road access to Seton Portage. Anderson Lake has good opportunities for boating, viewing and fishing. Nearby lowlands along the Gates River valley have potential for hiking, riding and viewing. Recreation potential on the adjacent mountain slopes is limited by steep topography and dense forest cover.

The D'Arcy suboption has moderate to severe visual potential impacts. A severe impact potential rating applies to the crossing of Anderson Lake because of its proximity to D'Arcy and because of the recreation subdivision at its southern end. A transmission line crossing also would severely degrade a highly significant viewing experience at Anderson Lake.

South of the Anderson Lake crossing visual impact potential is mainly moderate with the possibility of some small areas of high impact. The slopes along the east side of Gates River valley are characterized by a closed forest canopy. Benches and irregular slopes would mask many portions of this route from the highway, railway and settlements in the valley. However, certain areas would likely be exposed to view, particularly at, and south of, Haylmore Creek.

Overall in the D'Arcy suboption, the recreation impact potential is low and the aesthetic impact potential is severe.

LOKLA SUBOPTION - 1 KM

The Lokla suboption would require a diversion eastward entailing an extra transmission line crossing of the road. This would only be a minor visual concern because this section of the valley already features numerous views of transmission lines adjacent to and crossing the road.

Both the overall recreation and aesthetic impact potentials are rated as low in the Lokla suboption.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

The Whistler (LN) segment route near Function Junction crosses the Cheakamus River adjacent to 5L42 and has significant increased visual impact potential on two residences where a second tower would obstruct views westward across the Cheakamus River. This site is also important as an existing kayaking launching point on the river as well as a potential area for recreational development. The Function suboption would generally avoid these impacts and would also have the following benefits:

- it would be more concealed from Highway 99 and it would only be visible where it crosses the road at right angles; the Segment LN route would be visible at a diagonal to the highway and for a longer distance at the wetland area north of the road;
- it would avoid further clearing in the Miller Creek wetland and the construction of foundations in this habitat which has modest opportunities for wildlife viewing;
- it would cross the Cheakamus River in a more favourable location away from the kayaking launching site; and
- no natural tree cover would be disturbed in the vicinity of the Whistler gateway area behind the Whistler Museum and at the start of the Cheakamus Lake and Microwave Tower trails.

Overall in the Function suboption, the recreation impact potential is low and the aesthetic impact potential is mdoerate.

CALLAGHAN (N1Y2) SEGMENT - 6.7 KM

The B.C. Ministry of Crown Lands issued a proposal call in May 1990 for development of the Callaghan Valley. Preliminary intentions are for development of alpine skiing in the nearby mountains to the north and west. In addition, cross-country opportunities and residential and golf course developments are suggested for the lower Callaghan Valley. These proposed developments are in potential conflict with 5L46 using the Rainbow (MN) or Callaghan (N1Y2) segments. The original recreation/visual impact rating of low for the south portion of segment MN was revised to moderate-high because of these proposals. Impacts would vary depending upon the siting and nature of possible developments. Net visual impact potential would be moderate-high, if the residential and golf proposals were to proceed.

The Callaghan (N1Y2) segment also crosses the proposed residential and golf development area. Presently, conditions along segment N1Y2 are mainly comprised of recent clear cuts and disturbed vegetation on rolling terrain. The route would entail right angle crossings of Highway 99, the railway and Cheakamus River.

Overall in segment N1Y2, the recreation impact potential is moderate and the aesthetic impact potential is high.

HIGH CHEAKAMUS (YZT) SEGMENT - 36.6 KM

The High Cheakamus (YZT) segment parallels the east side of the Cheakamus River valley at an elevation between 400-900 m. The route crosses irregular terrain comprised of numerous benches, small ridges and draws. Vegetative cover is highly diverse with numerous clear cuts and second growth forests of various age classes alternating with rock outcrops and areas of scree. Segment YZT lies in the highly important travel and tourist corridor to Whistler. However, away from the road, the land along the route is not used significantly for recreation. The area of Jane Lakes, 3 km south of node Y, is of local importance for recreation. Several important access corridors lead eastward from the valley to Garibaldi Provincial Park and cross the segment YZT route; at Rubble Creek segment YZT crosses a narrow corridor which was added to the park in 1990.

Of the 36.6 km of segment YZT it appears that about 30 km would have little impact upon visual or recreation qualities, because the route is adequately hidden by topographic features from the Cheakamus travel corridor. Also, in many places, the varied vegetative cover could accommodate change with minimal visual impact. There are five small areas with recreational and visual impact potential:

- Jane Lakes to Daisy Lake (moderate impact potential) - For approximately 2 km 5L46 would be seen where it parallels the north end of Daisy Lake and Brandywine Falls Provincial Park. The route descends a ridge and crosses a small valley at an elevation between 700-900 m. A ROW would be visible in the vicinity of TL 8083 from along the highway and at Brandywine Falls Provincial Park. However, the viewing distances are 2-3 km and the line would not be on the skyline. The route also skirts Jane Lakes and would be visible along access routes to the lakes from the north and west; 5L46 would not be seen from the lakes due to an intervening ridge.
- Rubble Creek (high impact potential) - The route descends a steep hill on the north side of lower Rubble Creek, crosses the creek and access road to the Black Tusk trail head, then parallels Highway 99 at a distance of about 1-2 km in a southward direction. Inspection of topographic maps and air photos suggested significant visual impact potential around

Rubble Creek. However, field checks confirm that 5L46 would be effectively concealed from Highway 99 by vegetation and topography and only minor views of the line would be obtained from the road in lower Rubble Creek leading to the Black Tusk parking lot. The most visible elements would be glimpses of 5L46 descending the steep slope to the north as seen from adjacent sections along lower Rubble Creek. The conductors would be observed from the Black Tusk trail access road which would intersect 5L46 at right angles in a well treed area. Also, a short span of conductors would be visible at a few points from the access road towards the parking lot. The transmission line would be screened from view along the Black Tusk Trail by vegetation and from the viewpoint on the Barrier by topographic features.

The high impact potential rating reflects the fact that approximately 1,500 m of Garibaldi Park land would be crossed. A revision to the present route immediately west of the park boundary (refer to Map V-8) would have significantly increased visual impacts. Such an adjustment would involve descent and ascent on steep, exposed slopes north and south of Rubble Creek which would be more visible, particularly from the road in the valley bottom.

- Cheakamus Canyon (moderate impact potential) - Near the north end of Cheakamus Canyon, 5L46 would likely be visible to northbound travellers on Highway 99. Rock outcrops and irregular vegetative cover would tend to mask the ROW but there is potential for supporting towers and conductors to be be seen on the sky-line over a short distance in this section.

- North of Brohm Lake (moderate impact potential) - Near the north end of Brohm Lake the route rises from 600-900 m elevation up a bluff between Highway 99 and the Brohm River. This short section would be readily visible at relatively close range for southbound Highway 99 travellers. 5L46 was constructed by helicopter in this section and helicopters should be used again to avoid scarring by access roads.

- South of Brohm Lake (moderate impact potential) - Parallel to the south end of Brohm Lake the route descends a wooded hill which would be visible from a 400 meter section of Highway 99 for northbound travellers just south of Brohm Lake. The distance between viewers and 5L46 would be close to 2 km. The route would also cross and parallel the lower portion of the Brohm Ridge Trail access road.

Overall in segment YZT, the recreation impact potential is high and the aesthetic impact potential is moderate.

PINECREST (Y1N2P1) SEGMENT - 21.6 KM

For the first 4 km south of node Y1, the Pinecrest (Y1N2P1) segment parallels the west side of Highway 99 and the 2L1/2L2 transmission lines. This section occupies highly disturbed land featuring corridors which has relatively low recreation significance. Further south, the route crosses lower Callaghan and Brandywine creeks where these valleys open out and meet the main valley of the Cheakamus River. The lower Callaghan Valley contains the main access road serving Callaghan Lake and Alexander Falls. 5L46 would also pass very close to an important staging area for commercial recreation tours and trips into the Callaghan Valley and nearby mountain areas, mainly for skiing. As well, the Callaghan Valley has been proposed for major recreational and residential development.

The lower Brandywine Valley provides access to the Brandywine Creek Trail; it features moderately attractive second growth forests and level to rolling terrain with good development potential for recreational trails or camping and picnicing along Brandywine Creek. In this vicinity, segment Y1N2P1 skirts the northwest edge of U.R.E.P. 1-7-3-85 which, along with U.R.E.P. 1-7-3-89, represents recreationally important land adjacent to Brandywine Falls Provincial Park. These lowlands are currently used for cross-country skiing and snowmobiling and have good potential for the development of hiking, riding and bicycle trails.

The East (Y1YN2) suboption would parallel 5L42 on the lower slopes of logged terrain which extends south towards Jane Lakes. After crossing the Cheakamus River the route would continue southwest rather than parallel to 5L42 and it would cross lower Callaghan Creek on approach to node N2. The section adjacent to 5L42 is part of an upland unit which features a network of roads which are popular for driving, snowmobiling and cross-country skiing. The general area is also viewed by the Whistler as a future equestrian centre. Between the Cheakamus River and Callaghan Creek suboption Y1YN2 would be very close to, or would cross directly over, two of the three MOF Cal-Cheak campsites. These sites are very heavily used and are central to inter-connecting ski and snowmobile trails and recreation access roads.

South of Brandywine Creek the Central Section of segment Y1N2P1, ascends and crosses forested uplands west of Daisy Lake. Here, vegetation is in a natural condition free from evidence of logging and utility corridors. Closed-canopied forests dominate at the lower elevations while bedrock exposures and irregular ridges become prevalent above 700 meters elevation. Southwest of Brandywine Falls Provincial Park the route would cross the Brew Lake Trail which is presently situated in a relatively undisturbed condition.

The final 7 km descends approximately 4 km of forested uplands then crosses a lowland area of small lakes, the BC Rail line, Cheakamus River and Highway 99. The route would pass between Shadow and Stanley lakes within a few meters of both shorelines. This is the site of a proposed campsite development by BC Hydro. The site is connected to a series of hiking and cross-country ski trails which surround Shadow and Daisy lakes.

The recreation and aesthetic impact potential of segment Y1N2P1 varies from moderate in the northern sections to high in the central and southern sections. In suboption Y1YN2 recreation and aesthetic impact potential is assessed as moderate-high.

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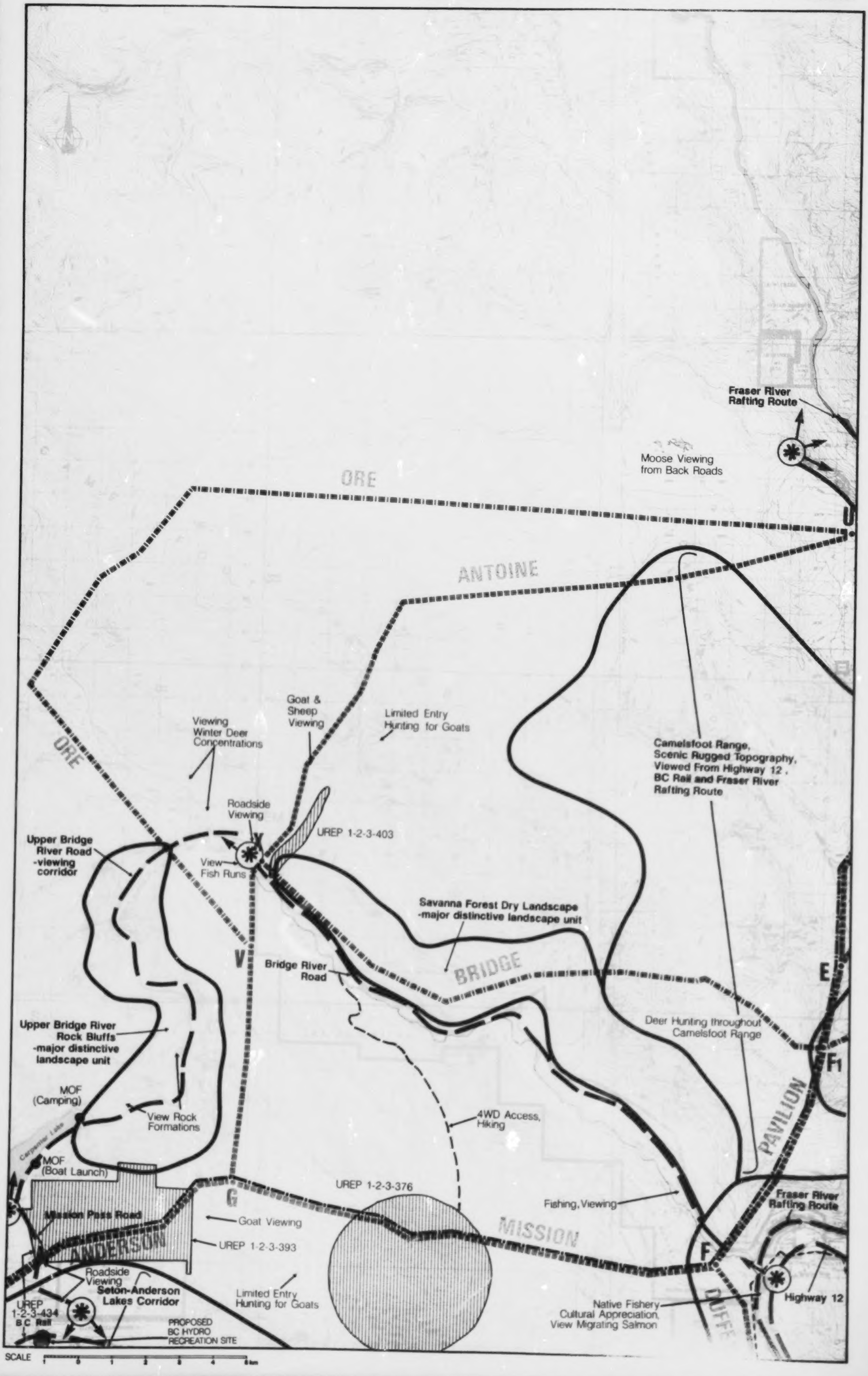
MAP SERIES V

Recreation and Aesthetics

Camelsfoot	**1 West**
Fraser River	**1 East**
Bridge River	**2**
Cayoosh	**3**
Anderson	**4 North**
Duffey	**4 South**
Gates River	**5**
Pemberton Valley	**6**
Whistler	**7**
Cheakamus	**8**

CAMELSFOOT

RECREATION AND AESTHETICS V-1 West


ORE
ANTOINE
ORE
BRIDGE
MISSION
ANDERSON
PAVILION
DUFFEY
U
V
G
F
E
F1
Fraser River Rafting Route
Moose Viewing from Back Roads
Goat & Sheep Viewing
Limited Entry Hunting for Goats
Viewing Winter Deer Concentrations
Roadside Viewing
UREP 1-2-3-403
Upper Bridge River Road -viewing corridor
View Fish Runs
Savanna Forest Dry Landscape -major distinctive landscape unit
Camelsfoot Range, Scenic Rugged Topography, Viewed From Highway 12, BC Rail and Fraser River Rafting Route
Bridge River Road
Upper Bridge River Rock Bluffs -major distinctive landscape unit
Deer Hunting throughout Camelsfoot Range
MOF (Camping)
View Rock Formations
4WD Access, Hiking
Carpenter Lake
MOF (Boat Launch)
UREP 1-2-3-376
Fishing, Viewing
Fraser River Rafting Route
Mission Pass Road
Goat Viewing
UREP 1-2-3-393
Roadside Viewing
Seton-Anderson Lakes Corridor
Limited Entry Hunting for Goats
Native Fishery Cultural Appreciation, View Migrating Salmon
Highway 12
UREP 1-2-3-434
B C Rail
PROPOSED BC HYDRO RECREATION SITE
SCALE
1
0
1
2
3
4
5 km

RECREATION AND AESTHETICS

Map Series V

LEGEND

TRANSMISSION SYSTEM

EXISTING

◆···◆···◆	2L1 RoW - not utilized for 5L46
--------	2L2
– – – – –	2L90 and 2L91
-------	3L2
········	5L41
▬·▬·▬	5L42

5L46 ROUTE ALTERNATIVES

┆┆┆┆┆┆	1989 NETWORK - Utilizing 2L1 RoW
▪▪▪▪▪▪	1989 NETWORK - Utilizing New RoW
▪ ▪ ▪ ▪	1989 NETWORK - Utilizing Existing Unoccupied RoW
┆┆┆┆┆	1990 ALTERNATIVES - Utilizing 2L1 RoW
▪┆▪┆▪┆	1990 ALTERNATIVES - Utilizing New RoW
▲	NETWORK NODE

RECREATION

PARKS, RECREATION FACILITIES AND EXISTING USE

TRAILS & ROUTES	Recreational trails, alpine routes and certain 4-wheel drive access roads.
SITE SPECIFIC AREAS	Small, site-specific recreation facilities such as Ministry of Forests campsites indicated by MoF or road-side view points.
UREP	Ministry of Parks areas of recreation interest designated for the "Use and Recreational Enjoyment of the Public"; where available, the Ministry of Parks file number is provided.
PARKS	Class A Provincial Parks, Provincial Recreation Areas, Municipal Parks and B C Hydro Recreation Areas.
PROPOSED PARKS	Proposed Provincial Parks and Recreation Areas; proposed B C Hydro Recreation Area developments; includes 1989 Blackcomb deletion and 1990 Rubble Creek addition to Garibaldi Provincial Park.
SKI AREAS	General outline of the Whistler and Blackcomb down-hill skiing areas including summer trails for hiking, mountain biking and alpine viewing.

CALLAGHAN VALLEY PROPOSAL

░	**GOLF/RESIDENTIAL**
░	**ALPINE SKIING**
▨	**NORDIC SKIING/RESIDENTIAL**
– – – –	**GOVERNMENT LAND RESERVE**

AESTHETICS

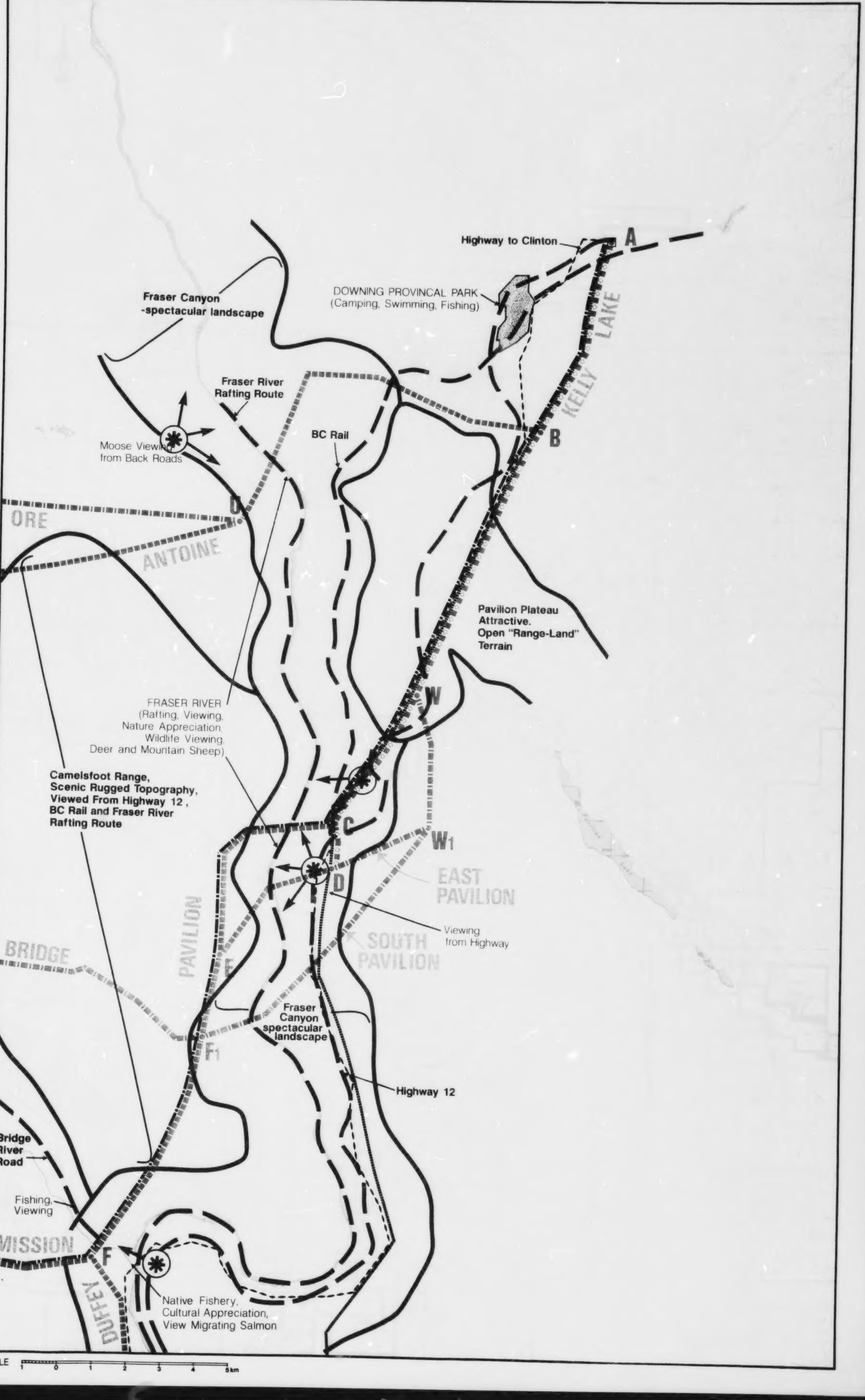
▬▬▬	**MAJOR DISTINCTIVE LANDSCAPE UNITS**
▬ ▬	**VIEWING CORRIDORS**
⊛	**MAJOR VIEW SITES & PROMONTORIES**

MAP SERIES V
LEGEND
(Foldout) →

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

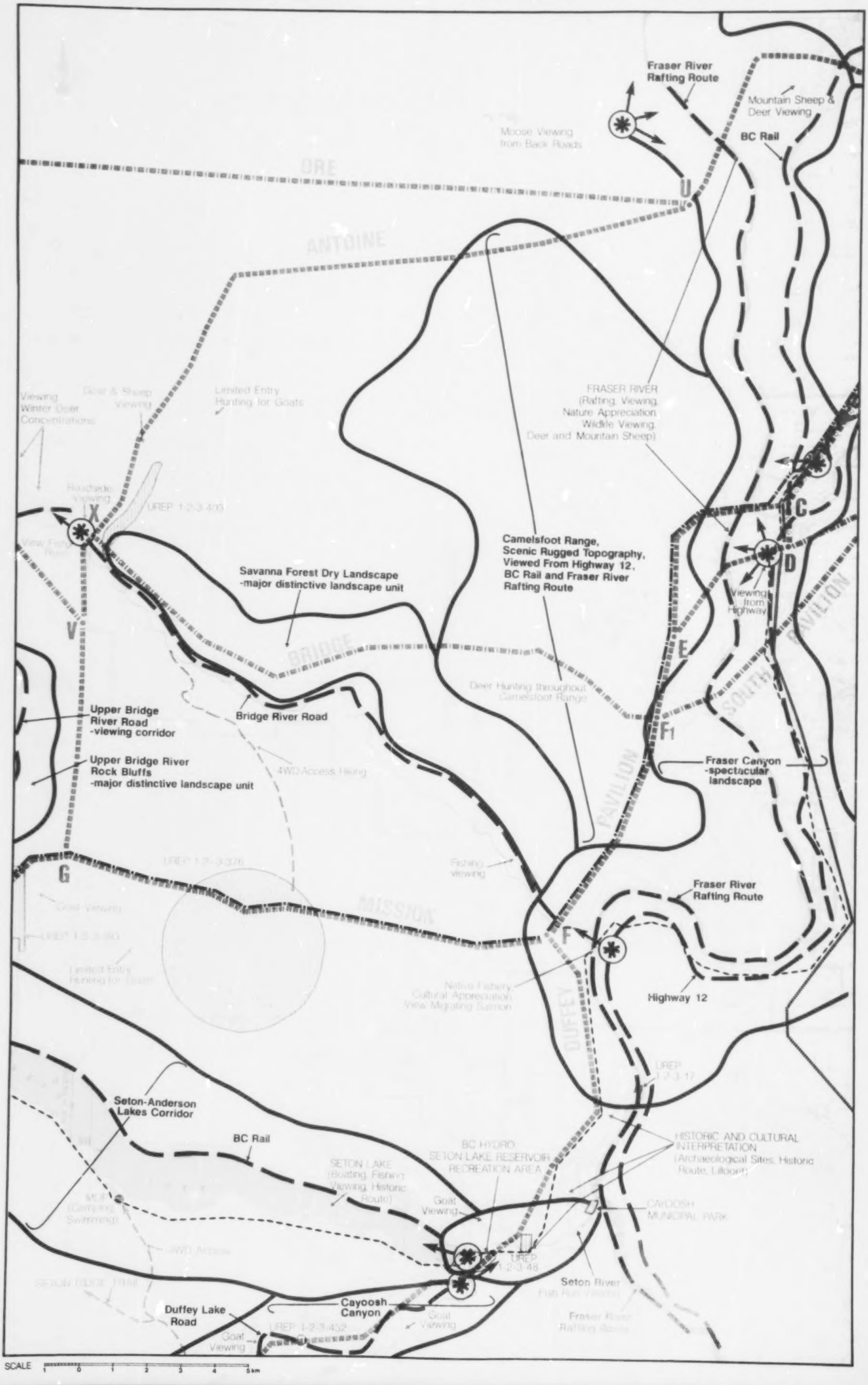
FRASER RIVER

RECREATION AND AESTHETICS V - 1 East



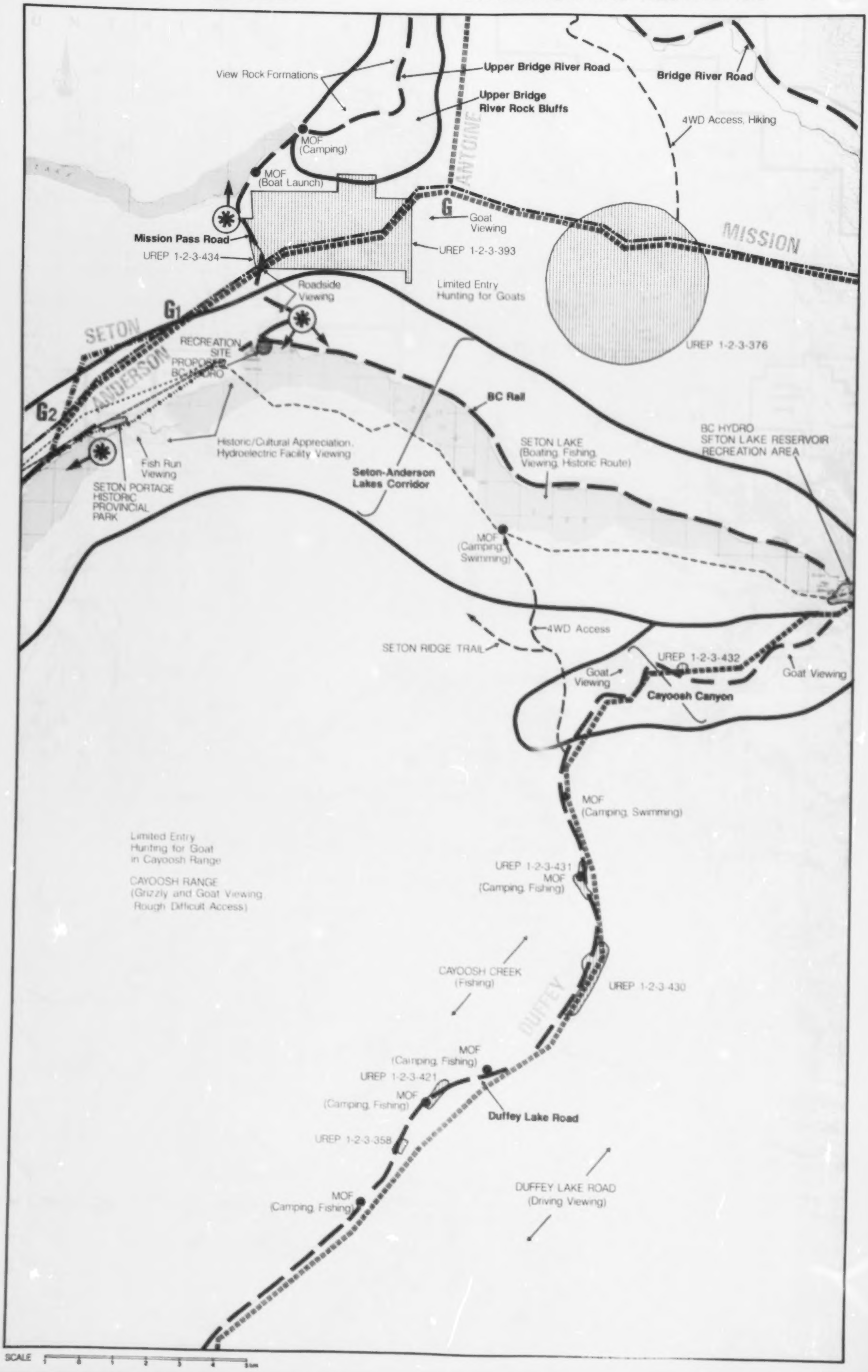
BRIDGE RIVER

RECREATION AND AESTHETICS V-2



CAYOOSH

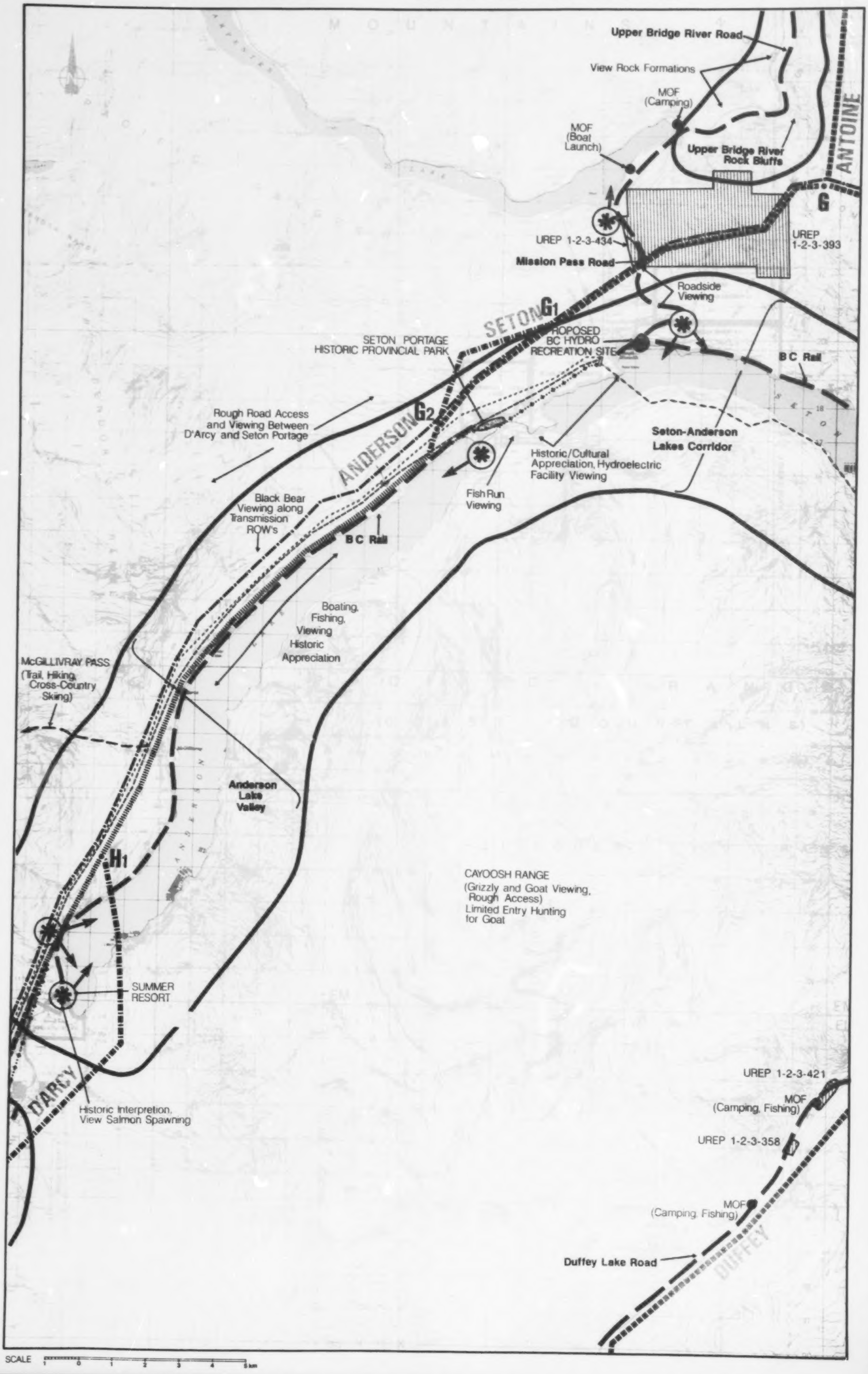
RECREATION AND AESTHETICS V-3



KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

ANDERSON

RECREATION AND AESTHETICS V – 4 North

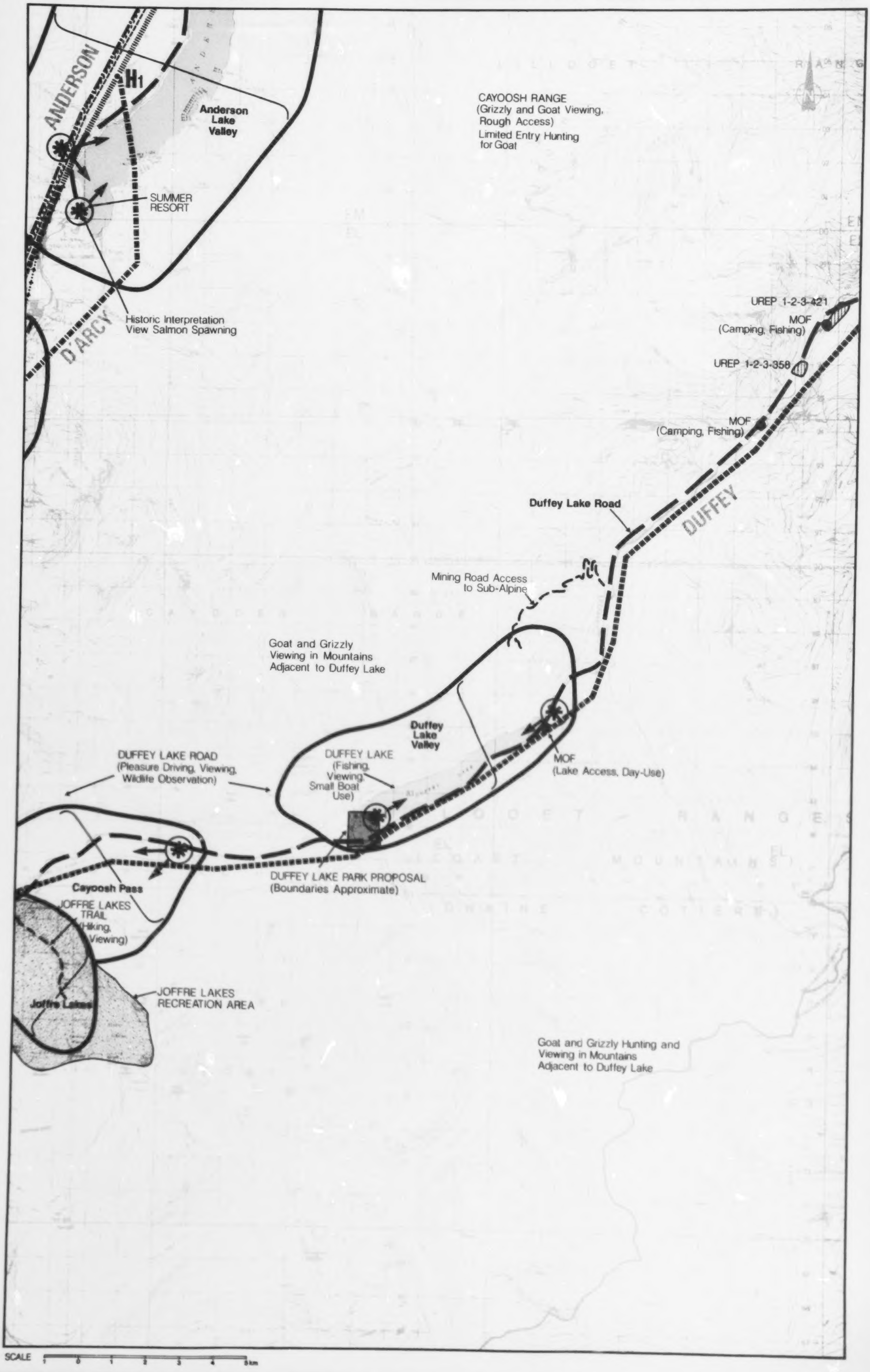


Upper Bridge River Road
View Rock Formations
MOF (Camping)
MOF (Boat Launch)
Upper Bridge River Rock Bluffs
ANTOINE
G
UREP 1-2-3-434
UREP 1-2-3-393
Mission Pass Road
Roadside Viewing
SETON
G1
PROPOSED BC HYDRO RECREATION SITE
SETON PORTAGE HISTORIC PROVINCIAL PARK
B C Rail
Rough Road Access and Viewing Between D'Arcy and Seton Portage
G2
ANDERSON
Seton-Anderson Lakes Corridor
Historic/Cultural Appreciation, Hydroelectric Facility Viewing
Fish Run Viewing
Black Bear Viewing along Transmission ROW's
B C Rail
Boating, Fishing, Viewing Historic Appreciation
McGILLIVRAY PASS (Trail, Hiking, Cross-Country Skiing)
Anderson Lake Valley
H1
CAYOOSH RANGE (Grizzly and Goat Viewing, Rough Access) Limited Entry Hunting for Goat
SUMMER RESORT
D'ARCY
Historic Interpretion, View Salmon Spawning
UREP 1-2-3-421
MOF (Camping, Fishing)
UREP 1-2-3-358
MOF (Camping, Fishing)
Duffey Lake Road
DUFFEY
SCALE
1
0
1
2
3
4
5 km

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

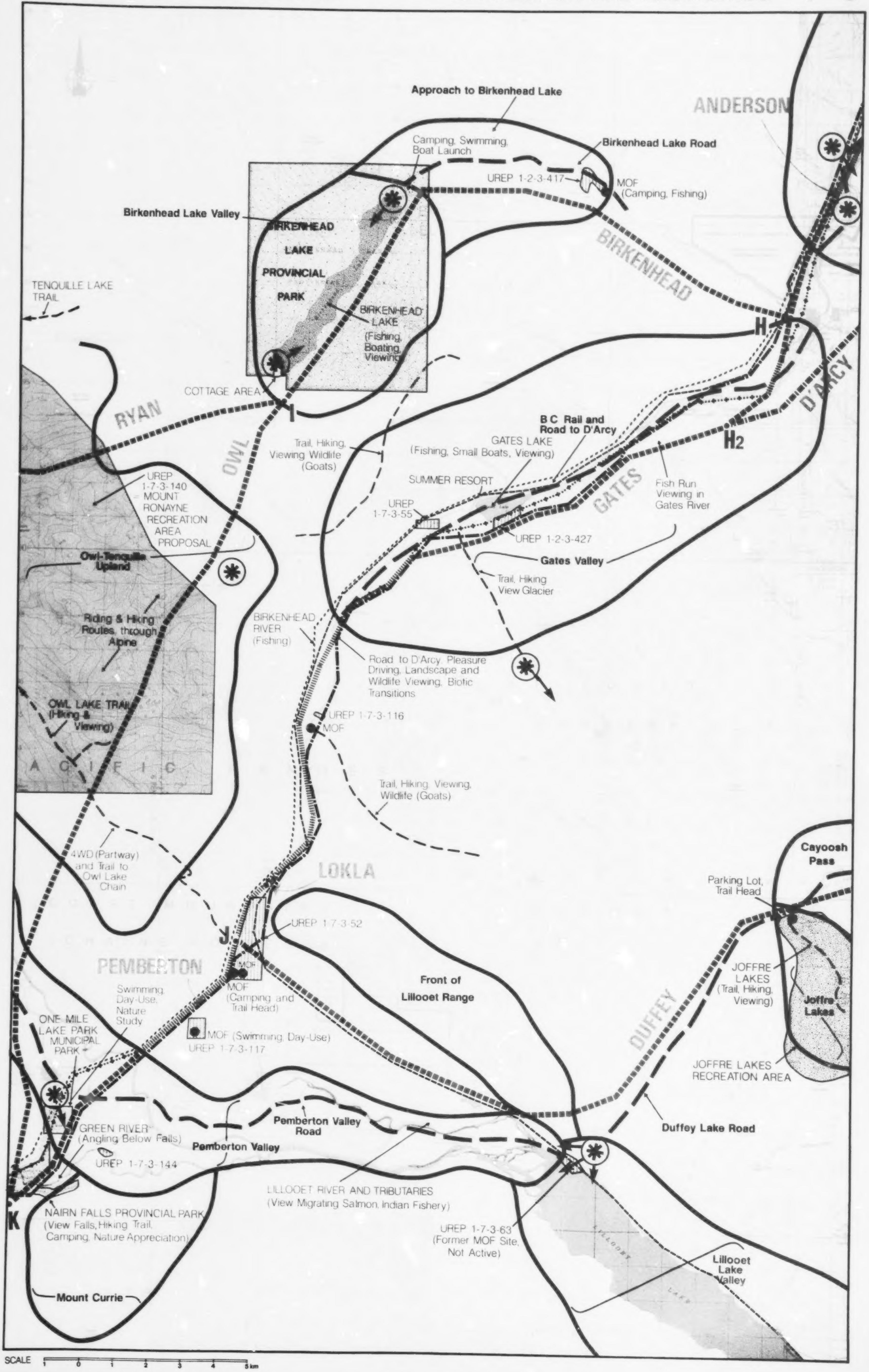
DUFFEY

RECREATION AND AESTHETICS V – 4 South



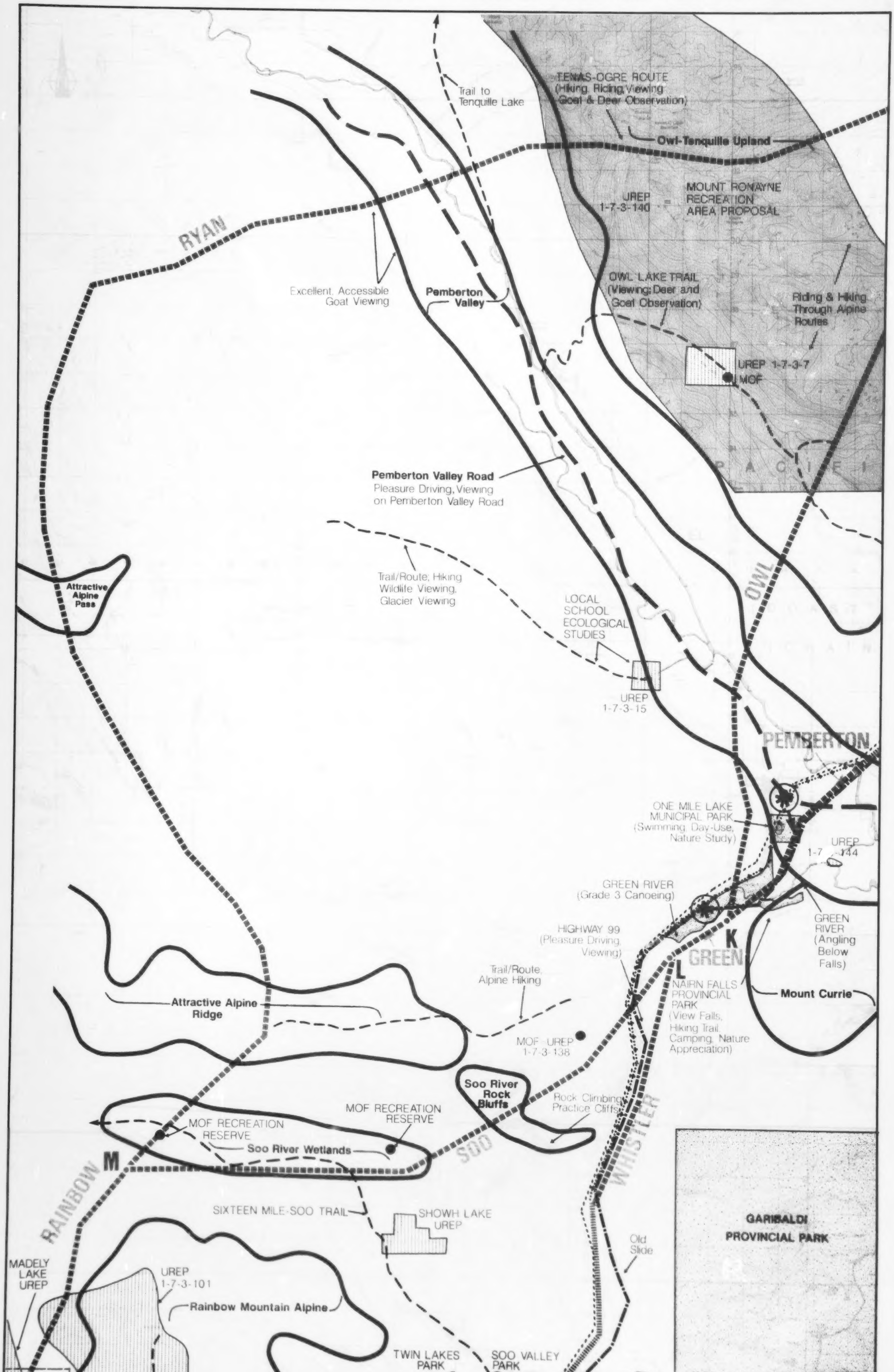
GATES RIVER

RECREATION AND AESTHETICS


Approach to Birkenhead Lake
ANDERSON
Camping, Swimming, Boat Launch
Birkenhead Lake Road
UREP 1-2-3-417
MOF (Camping, Fishing)
Birkenhead Lake Valley
BIRKENHEAD LAKE PROVINCIAL PARK
BIRKENHEAD LAKE (Fishing, Boating, Viewing)
BIRKENHEAD
TENQUILLE LAKE TRAIL
H
D'ARCY
COTTAGE AREA
RYAN
I
OWL
B C Rail and Road to D'Arcy
H2
Trail, Hiking, Viewing Wildlife (Goats)
GATES LAKE (Fishing, Small Boats, Viewing)
UREP 1-7-3-140 = MOUNT RONAYNE RECREATION AREA PROPOSAL
SUMMER RESORT
GATES
Fish Run Viewing in Gates River
UREP 1-7-3-55
UREP 1-2-3-427
Owl-Tenquille Upland
Gates Valley
Trail, Hiking View Glacier
Riding & Hiking Routes, through Alpine
BIRKENHEAD RIVER (Fishing)
Road to D'Arcy, Pleasure Driving, Landscape and Wildlife Viewing, Biotic Transitions
OWL LAKE TRAIL (Hiking & Viewing)
UREP 1-7-3-116
MOF
PACIFIC
Trail, Hiking, Viewing, Wildlife (Goats)
4WD (Partway) and Trail to Owl Lake Chain
LOKLA
Cayoosh Pass
Parking Lot, Trail Head
UREP 1-7-3-52
J
PEMBERTON
MOF
Front of Lillooet Range
JOFFRE LAKES (Trail, Hiking, Viewing)
Joffre Lakes
Swimming, Day-Use, Nature Study
MOF (Camping and Trail Head)
ONE MILE LAKE PARK MUNICIPAL PARK
DUFFEY
MOF (Swimming, Day-Use)
UREP 1-7-3-117
JOFFRE LAKES RECREATION AREA
GREEN RIVER (Angling Below Falls)
Pemberton Valley Road
Duffey Lake Road
Pemberton Valley
UREP 1-7-3-144
LILLOOET RIVER AND TRIBUTARIES (View Migrating Salmon, Indian Fishery)
K
NAIRN FALLS PROVINCIAL PARK (View Falls, Hiking Trail, Camping, Nature Appreciation)
UREP 1-7-3-63 (Former MOF Site, Not Active)
Lillooet Lake Valley
LILLOOET LAKE
Mount Currie
SCALE
1
0
1
2
3
4
5 km

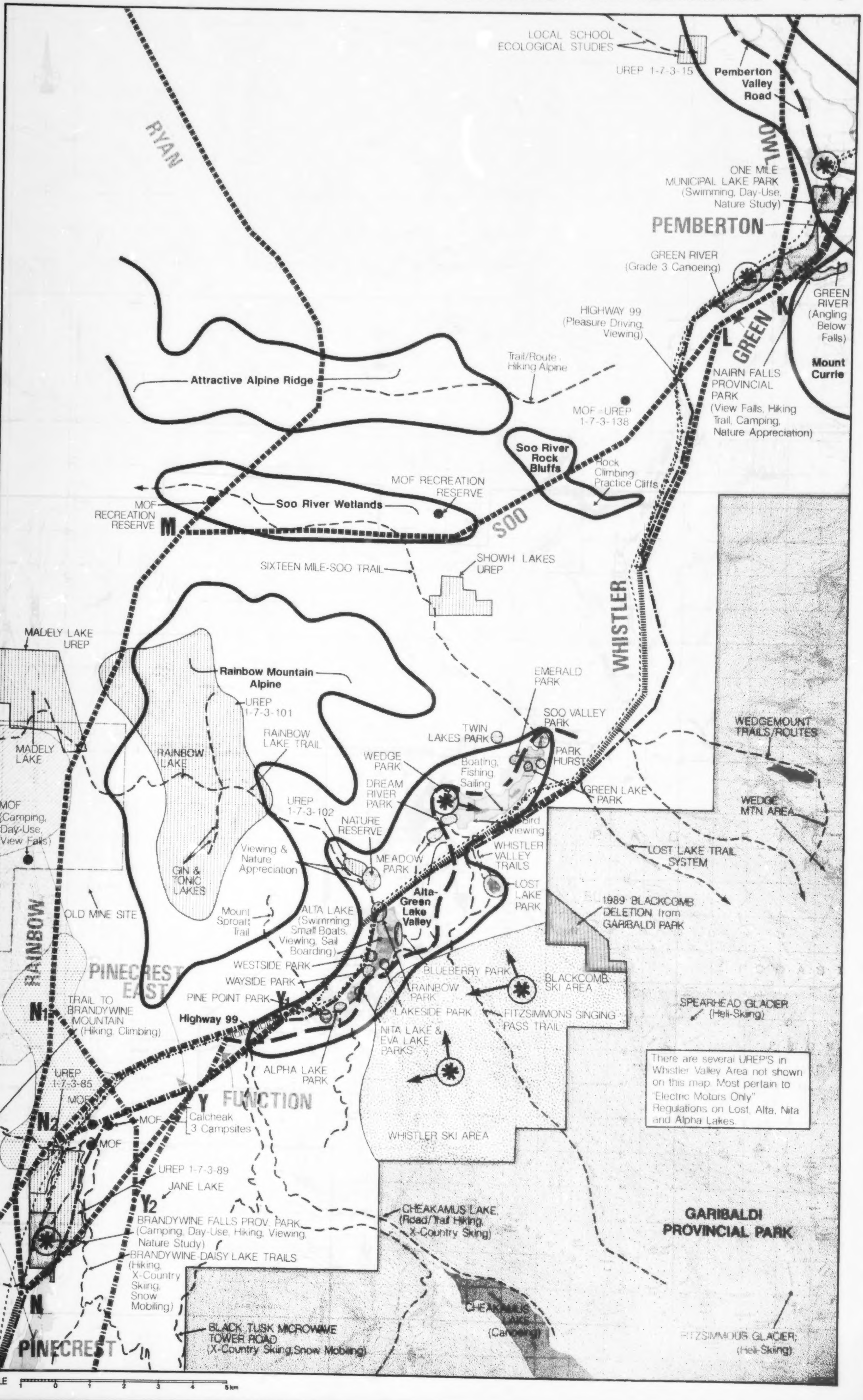
PEMBERTON VALLEY

RECREATION AND AESTHETICS V-6


Trail to Tenquille Lake
TENAS-OGRE ROUTE (Hiking, Riding, Viewing Goat & Deer Observation)
Owl-Tenquille Upland
UREP 1-7-3-140 = MOUNT RONAYNE RECREATION AREA PROPOSAL
RYAN
Excellent, Accessible Goat Viewing
Pemberton Valley
OWL LAKE TRAIL (Viewing: Deer and Goat Observation)
Riding & Hiking Through Alpine Routes
UREP 1-7-3-7 MOF
Pemberton Valley Road
Pleasure Driving, Viewing on Pemberton Valley Road
Attractive Alpine Pass
Trail/Route; Hiking Wildlife Viewing, Glacier Viewing
LOCAL SCHOOL ECOLOGICAL STUDIES
OWL
UREP 1-7-3-15
PEMBERTON
ONE MILE LAKE MUNICIPAL PARK (Swimming, Day-Use, Nature Study)
UREP 1-7-3-144
GREEN RIVER (Grade 3 Canoeing)
GREEN RIVER (Angling Below Falls)
HIGHWAY 99 (Pleasure Driving, Viewing)
K
GREEN
L
Trail/Route, Alpine Hiking
NAIRN FALLS PROVINCIAL PARK (View Falls, Hiking Trail, Camping, Nature Appreciation)
Mount Currie
Attractive Alpine Ridge
MOF UREP 1-7-3-138
Soo River Rock Bluffs
Rock Climbing Practice Cliffs
MOF RECREATION RESERVE
MOF RECREATION RESERVE
Soo River Wetlands
M
SOO
WHISTLER
RAINBOW
SIXTEEN MILE-SOO TRAIL
SHOWH LAKE UREP
GARIBALDI PROVINCIAL PARK
Old Slide
MADELY LAKE UREP
UREP 1-7-3-101
Rainbow Mountain Alpine
TWIN LAKES PARK
SOO VALLEY PARK
EMERALD PARK
WEDGEMOUNT TRAILS/ROUTES
SCALE 1 0 1 2 3 4 5km

WHISTLER

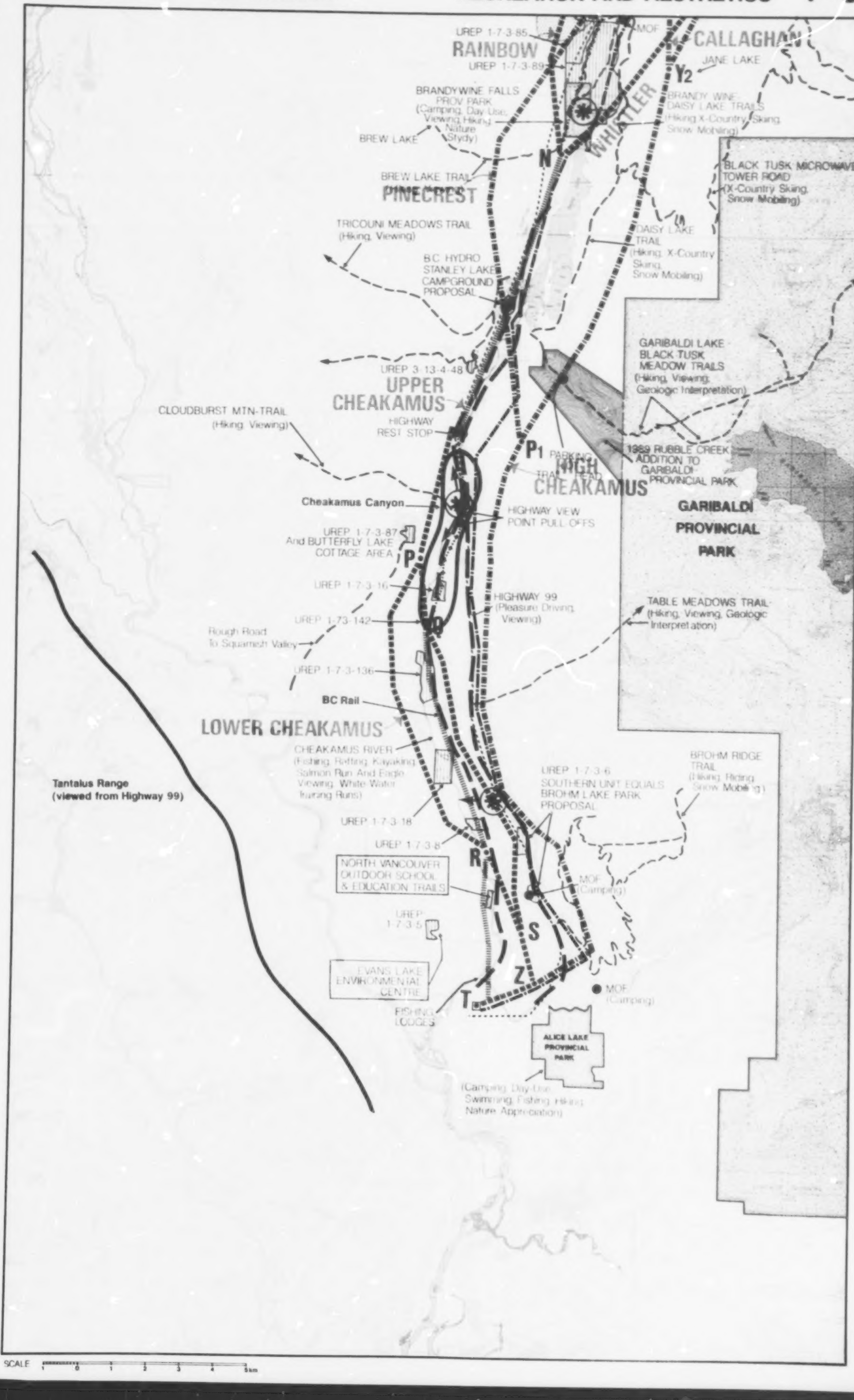
RECREATION AND AESTHETICS V-7


LOCAL SCHOOL ECOLOGICAL STUDIES
UREP 1-7-3-15
Pemberton Valley Road
OWL
RYAN
ONE MILE MUNICIPAL LAKE PARK (Swimming, Day-Use, Nature Study)
PEMBERTON
GREEN RIVER (Grade 3 Canoeing)
GREEN RIVER (Angling Below Falls)
Mount Currie
HIGHWAY 99 (Pleasure Driving, Viewing)
GREEN
L
K
NAIRN FALLS PROVINCIAL PARK (View Falls, Hiking Trail, Camping, Nature Appreciation)
Attractive Alpine Ridge
Trail/Route Hiking Alpine
MOF - UREP 1-7-3-138
Soo River Rock Bluffs
Rock Climbing Practice Cliffs
MOF RECREATION RESERVE
Soo River Wetlands
MOF RECREATION RESERVE
M
SOO
SIXTEEN MILE-SOO TRAIL
SHOWH LAKES UREP
WHISTLER
MADELY LAKE UREP
Rainbow Mountain Alpine
UREP 1-7-3-101
RAINBOW LAKE TRAIL
MADELY LAKE
RAINBOW LAKE
EMERALD PARK
SOO VALLEY PARK
TWIN LAKES PARK
WEDGEMOUNT TRAILS/ROUTES
WEDGE PARK
Boating, Fishing, Sailing
PARK HURST
DREAM RIVER PARK
GREEN LAKE PARK
WEDGE MTN AREA
UREP 1-7-3-102
NATURE RESERVE
Bird Viewing
MOF (Camping, Day-Use, View Falls)
Viewing & Nature Appreciation
MEADOW PARK
WHISTLER VALLEY TRAILS
LOST LAKE TRAIL SYSTEM
GIN & TONIC LAKES
LOST LAKE PARK
Alta-Green Lake Valley
1989 BLACKCOMB DELETION from GARIBALDI PARK
RAINBOW
OLD MINE SITE
Mount Sproatt Trail
ALTA LAKE (Swimming, Small Boats, Viewing, Sail Boarding)
PINECREST EAST
WESTSIDE PARK
BLUEBERRY PARK
BLACKCOMB SKI AREA
WAYSIDE PARK
RAINBOW PARK
N1
TRAIL TO BRANDYWINE MOUNTAIN (Hiking, Climbing)
PINE POINT PARK
Y
LAKESIDE PARK
FITZSIMMONS SINGING PASS TRAIL
SPEARHEAD GLACIER (Heli-Skiing)
Highway 99
NITA LAKE & EVA LAKE PARKS
ALPHA LAKE PARK
UREP 1-7-3-85
MOF
Y FUNCTION
N2
MOF
Calcheak 3 Campsites
MOF
WHISTLER SKI AREA
UREP 1-7-3-89
JANE LAKE
Y2
BRANDYWINE FALLS PROV. PARK (Camping, Day-Use, Hiking, Viewing, Nature Study)
CHEAKAMUS LAKE (Road/Trail Hiking, X-Country Skiing)
GARIBALDI PROVINCIAL PARK
BRANDYWINE-DAISY LAKE TRAILS (Hiking, X-Country Skiing, Snow Mobiling)
N
CHEAKAMUS LAKE (Canoeing)
BLACK TUSK MICROWAVE TOWER ROAD (X-Country Skiing, Snow Mobiling)
FITZSIMMONS GLACIER (Heli-Skiing)
PINECREST
SCALE
1 0 1 2 3 4 5 km

There are several UREP'S in Whistler Valley Area not shown on this map. Most pertain to "Electric Motors Only" Regulations on Lost, Alta, Nita and Alpha Lakes.

CHEAKAMUS

RECREATION AND AESTHETICS V-8


UREP 1-7-3-85
RAINBOW
MOF
CALLAGHAN
UREP 1-7-3-89
JANE LAKE
Y2
BRANDYWINE FALLS PROV PARK (Camping, Day Use, Viewing, Hiking, Nature Stydy)
BREW LAKE
BRANDY WINE-DAISY LAKE TRAILS (Hiking X-Country Skiing, Snow Mobiling)
WHISTLER
N
BREW LAKE TRAIL
PINECREST
BLACK TUSK MICROWAVE TOWER ROAD (X-Country Skiing, Snow Mobiling)
TRICOUNI MEADOWS TRAIL (Hiking, Viewing)
DAISY LAKE TRAIL (Hiking, X-Country Skiing, Snow Mobiling)
B.C. HYDRO STANLEY LAKE CAMPGROUND PROPOSAL
GARIBALDI LAKE BLACK TUSK MEADOW TRAILS (Hiking, Viewing, Geologic Interpretation)
UREP 3-13-4-48
UPPER CHEAKAMUS
CLOUDBURST MTN-TRAIL (Hiking, Viewing)
HIGHWAY REST STOP
P1
PARKING TRAIL HEAD
HIGH CHEAKAMUS
1989 RUBBLE CREEK ADDITION TO GARIBALDI PROVINCIAL PARK
GARIBALDI PROVINCIAL PARK
Cheakamus Canyon
HIGHWAY VIEW POINT PULL OFFS
UREP 1-7-3-87 And BUTTERFLY LAKE COTTAGE AREA
P
UREP 1-7-3-16
HIGHWAY 99 (Pleasure Driving, Viewing)
TABLE MEADOWS TRAIL (Hiking, Viewing, Geologic Interpretation)
UREP 1-73-142
Q
Rough Road To Squamish Valley
UREP 1-7-3-136
BC Rail
LOWER CHEAKAMUS
CHEAKAMUS RIVER (Fishing, Rafting, Kayaking, Salmon Run And Eagle Viewing, White Water Tubing Runs)
Tantalus Range (viewed from Highway 99)
UREP 1-7-3-6 SOUTHERN UNIT EQUALS BROHM LAKE PARK PROPOSAL
BROHM RIDGE TRAIL (Hiking, Riding, Snow Mobiling)
UREP 1-7-3-18
UREP 1-7-3-8
R
NORTH VANCOUVER OUTDOOR SCHOOL & EDUCATION TRAILS
MOF (Camping)
UREP 1-7-3-5
S
EVANS LAKE ENVIRONMENTAL CENTRE
Z
T
FISHING LODGES
MOF (Camping)
ALICE LAKE PROVINCIAL PARK
(Camping, Day-Use, Swimming, Fishing, Hiking, Nature Appreciation)
SCALE
1 0 1 2 3 4 5km

VI
HERITAGE

ETHNOGRAPHY

Three ethnolinguistic groups are found in the Study Area (Figure VI-1): two are subdivisions of the Interior Salish (Shuswap and Lillooet), while one is a subdivision of the Coast Salish (Squamish).

SHUSWAP

The Shuswap territories are located within the Interior Plateau along the middle Fraser River and extend east to the Rocky Mountains. The principal villages of the Fraser bands were located mainly on the river's east bank between Soda and High Bar creeks. Their hunting territories extended about 40 km west of the Fraser. Annual subsistence activities were divided into five major seasons: early summer, fresh water fishing and berry gathering; late summer/early fall, salmon fishing centred on the Fraser; game hunting in the fall in the mountains; subsistence on dried food in permanent villages during the winter; and dispersal to hunting and gathering areas in the spring (Teit, 1909).

Winter village dwellings were circular, semi-subterranean pithouses, while in summer temporary mat lodges were constructed above ground. Travel was by bark or dugout canoes on the waterways or overland on foot or snowshoe in winter. The Shuswaps traded primarily with the Lillooet and Chilcotin peoples. Their more permanent habitation sites are located in the valleys; hunting and gathering areas are found in the mountains and plateaus, and the fishing sites by rivers and lakes (Teit, 1909). Temporary encampments and caches could exist in any of these areas as well as along trade and travel routes. In the study area the Shuswaps are represented by the Whispering Pines Band.

LILLOOET

The Lillooet territories lie in both the rugged Coast Mountains and the dry Interior Plateau. Historically four separate Lillooet bands have been identified (Teit, 1906; 1909):

- Lower Lillooet - located along the lower Lillooet River;
- Pemberton - located on the upper Lillooet River, Pemberton Meadows, Lillooet Lake, Poole River, and Green Lake;
- Lakes - territory includes Anderson and Seton lakes, Cayuse (sic) Creek, and Duffey Lake and extended west to the headwaters of Jervis Inlet, and northeast to the upper Bridge River and its sources; and
- Fraser River - inhabited the Fraser River from five miles south of Cayuse (*sic*) Creek to about Pavilion Creek, and hunted east to Hat Creek and west along the lower part of the Bridge River.

The Study Area includes the territories of the latter three bands which correspond approximately to the contemporary Mount Currie, Anderson, Seton Lake, Pavilion, Bridge River, Lillooet, Cayoose Creek and Fountain bands.

Salmon procurement along the major rivers and lakes in summer was the most important economic activity of the Lillooet people. Large quantities of salmon were dried and stored in cache pits for winter use. Hunting for a variety of game (deer, mountain goat, mountain sheep, caribou, marmot, black bear, beaver, rabbit, squirrel and porcupine) was carried out mainly in the late fall and spring. Migratory birds and grouse species were also hunted. Winter was spent in permanent villages situated on the major rivers and lakes, subsisting on dried foods. In spring, the families dispersed to hunting and gathering areas. A variety of vegetal foods, including shoots, roots, and berries were gathered in spring and summer (Teit, 1906).

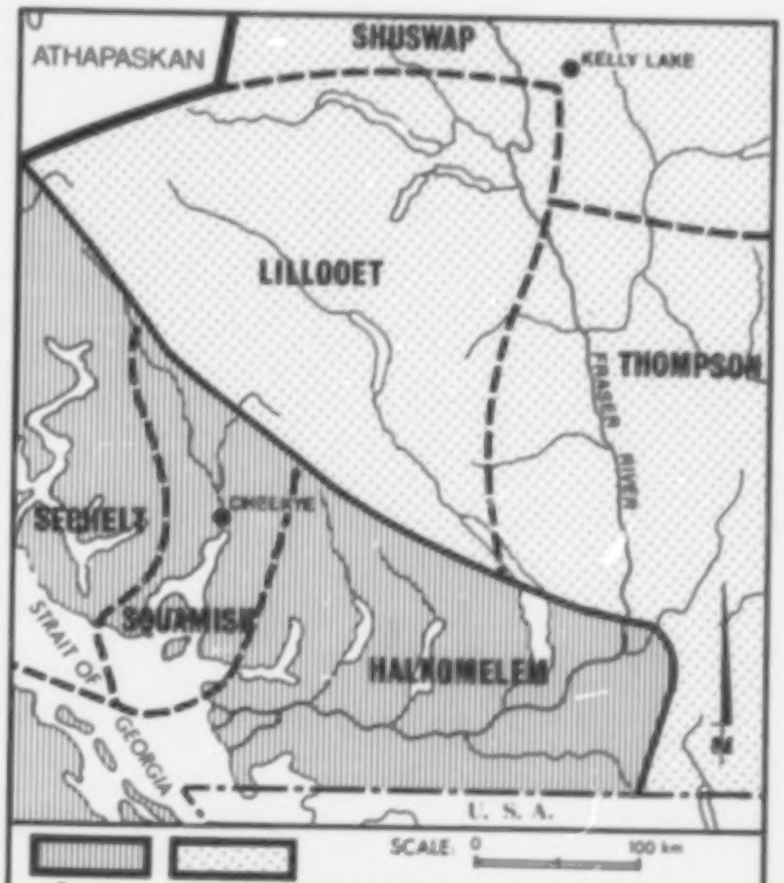


FIGURE VI-1
SALISHAN LINGUISTIC GROUPS

Permanent dwellings were semi-subterranean pithouses, many of which were still inhabited in 1860 along Anderson and Seton Lakes (Teit, 1906). Water travel in summer was by bark canoe or raft and temporary dwellings were mat lodges. Snowshoes were used for winter travel.

The Lillooet bands traded between themselves and with the Shuswap, Thompson, Sechelt, and Squamish people. Two regular trails to the coast at Jervis Inlet and Howe Sound were used for trading. Some trade was conducted with the Chilcotin people to the north, but there also were hostilities with them (Teit, 1906).

Salmon fishing stations and winter villages were located on the major rivers and lakes. Summer, spring, and fall sites ranged from the valley bottoms to the upland plateaus and included smaller creek valleys. Food caches and temporary shelters could be found in any of these areas and may also be evident along travel and trade routes.

SQUAMISH

The Squamish people are a Coast Salish group whose material culture indicates a strong riverine adaptation. Traditional Squamish territory comprises the Squamish River drainage and Howe Sound. Nine winter village sites have been identified along the Squamish upstream to its junction with the Cheakamus River, one on the Cheakamus and six more on the Squamish above the confluence (Barnett, 1955). Summer places tended to be located on the inlets and bays.

Food gathering occupied the Squamish people from spring to late fall, including catching and drying large quantities of salmon, collecting shoots and berries, and hunting mountain goat and deer. Their permanent dwellings were large plank houses and their temporary shelters were of mat-covered poles. Weirs and traps were used to catch salmon (Barnett, 1955).

The Squamish traded with the Lillooet and neighbouring coastal groups. Water travel was by dugout canoe and snowshoes were used in the winter. The study area includes the northern territory of the Squamish people in the vicinity of the Cheakamus River. During ethnographic times this area was not too important for winter use, but may have been utilized more in previous times. Other activities that may have occurred in the Cheakamus Valley are fishing, hunting, and gathering from temporary shelters.

HISTORIC SUMMARY

Portions of the Study Area are rich in recent history. On the coast, the first recorded activities were explorations undertaken by sailing vessels in the 1790's. The earliest historic contact in the Interior was a result of the fur trade in northeastern British Columbia. Simon Fraser was the first caucasian to explore the river that now bears his name and was the first to pass through the northern portion of the Study Area. The North West and Hudson Bay companies, which amalgamated in 1821, operated a series of fur-trade posts on the Fraser Plateau in the 19th century. Trade to the posts extended from northern to southern B.C. and some native travel-ways became historic trade routes.

The discovery of gold in the Cariboo in the late 1850's led to the construction of the Harrison to Lillooet trail (along which Mount Currie, D'Arcy, and Seton Portage were important places) and the start of settlements and agriculture, in the Pemberton Valley and in the vicinity of Lillooet. By the 1880's gold exploration extended to the Bridge River region. Railway construction from Howe Sound traversed the study area in its present location reaching Lillooet in 1914. Logging, farming and ranching continued to grow giving rise to further settlement and roadways.

There is evidence of mining operations throughout most of the Study Area's northern sector: placer mining in the vicinity of the Fraser River crossing on the Antoine (BG) segment; and remnants of a gold mill at McGillivray Creek. Part of an historic trail and telephone line were noted near McGillivray Creek, and immediately to the south, part of the historic pack trail along Anderson Lake is still evident.

Evidence of early agriculturally supported settlement is present in the northern sector of the Study Area. Ditches on the Pavilion Plateau originally were excavated to supply water to mines on the Fraser River benches, and later were modified for irrigation. The Fraser from Pavilion Creek to Lillooet also was important to agriculture and early farms were established in the Gates and Birkenhead river valleys and in Pemberton Meadows. The major economic activity southwest of Pemberton was logging. Tourism based on Whistler has grown dramatically since 1965 and may now be the dominant activity.

METHODOLOGY

The recording and evaluation techniques in this study comply with the requirements of the Archaeology and Outdoor Recreation (AOR) Branch of the B.C. Ministry of Municipal Affairs, Recreation and Culture. Field information was recorded on standard site inventory forms. The field work carried out in 1982 was on the route alternatives under consideration at that time: Kelly Lake to Cheekye via Pavilion Plateau, Mission Ridge, Anderson Lake, Gates Lake, Pemberton, Whistler and the Cheakamus Valley; and the Antoine segment. In 1989 this original work was updated and expanded to include the remaining segments of the network: Duffey, Birkenhead, Owl, Ryan, Soo,and Rainbow. The 1989 work was limited to an overview assessment due to the lack of defined route centerlines and, in some cases, lack of access permission. The 1990 Alternatives - Ore, Bridge,East Pavilion, South Pavilion, Callaghan, High Cheakamus and Pinecrest segments and the Seton, D'arcy, Lokla, Function and Pinecrest East suboptions - were investigated by helicopter reconnaissance and literature review.

Thirty-eight new heritage sites were recorded in 1982 and 15 previously recorded sites were visited. During the 1989 update, only those sites with potential to be impacted by any of the route segments were revisited and reassessed. A number of sites were downgraded from the 1982 assessment due to condition and/or a decrease in the cultural yield; several sites were upgraded due to an increase in yield. Three new heritage sites were recorded and three isolated finds were reported in the route assessment process.

The Borden site identification system was utilized to number sites; it is a Canada-wide archaeological map grid reference scheme which has been universally accepted by archaeologists (refer to the map series VI legend). Each two-degree block of latitude and four degrees of longitude is given a two capital letter designation (i.e. ER); the blocks are subdivided into 10 minute intervals and identified by small letter sub-designations (i.e. f/l), 24 on the horizontal axis and 12 on the vertical axis. Each site within the Borden Blocks is then given a number: for example, heritage site EfRl 1 is the first recorded site in f/l sub-block of Borden Block ER.

ASSESSMENT

The site heritage evaluation criteria varied depending upon what was visible and what was predicted. The condition of the heritage resources was an important consideration in the evaluations. Extensively disturbed sites generally have less potential value than those that are intact. However, site disturbance restricted to the upper deposits might not have interfered with more deeply buried cultural material. Sites whose context had been destroyed and/or those consisting of a single find were considered to have no heritage value; sites which had limited or surface only disturbance were rated as having low to very high significance depending upon their other characteristics (type, size, location, and depth and nature of cultural deposit). Heritage site condition was evaluated by the degree of deterioration, vandalism, or disturbance of the actual remains rather than primarily considering cultural site deposits.

SITE EVALUATION

Five site evaluation categories have been employed:

- Very High - Sites that because of their size, the density of their yield, condition, content, context, and/or uniqueness are judged to have very high significance. Burials are included in this category; these sites should be avoided.

- High - Sites that are judged to be significant and could contribute greatly to the better understanding of the heritage of the region or province. Although some surface disruption may be evident, they are culturally intact, contain a significant amount of data (or potential for), and/or represent an aspect of heritage which is little known. They are generally smaller and less culturally complex than the above sites; these sites should be avoided.

- Moderate - Included in this category are smaller sites that are relatively frequent or sites which have been substantially disturbed and would provide less data in terms of the region's heritage; these sites should be avoided.

- Low - The potential contribution of these sites is lower than sites in the above category. This rating includes those that are represented by a few cultural features or surface remains, which have little potential for substantial, intact buried deposits and/or are extensively disturbed. Also included are a number of historic sites which due to their deterioration, the degree of disturbance, or the fact that they are relatively recent, will provide little additional heritage data; these sites should be avoided when possible.

- No Value - Sites whose context has been completely destroyed or are represented by a single find. Recording and/

or collection of these finds is judged to be sufficient mitigation; little future value is predicted.

The type of impact predicted for each of the sites was determined primarily on the basis of location. Direct impacts are expected to occur at sites located immediately adjacent to or within the route alternatives. Indirect impact potential at such sites has also been identified as their location makes them vulnerable to activities relating to transmission line construction and its later use and maintenance. Direct and indirect impact potential has also been identified at sites which are located near or on an access route that may be used for construction and/or maintenance.

IMPACT POTENTIAL RATINGS

In determining the overall impact potential for the route alternatives, the following criteria were considered: the type of investigation undertaken; the number of known sites in the vicinity; their significance and impact potential; and the potential for unrecorded heritage resources in the area. Four overall impact potential ratings were used:

- Negligible - those routes subjected to a detailed inventory and impact assessment with negative results.
- Low - those routes in which any direct potential impact on recorded sites involves those with no value or low significance and/or in which only a small proportion of the route is characterized by areas with low-moderate to moderate-high potential for unrecorded heritage resources.
- Moderate - those routes in which a limited proportion of the alignment is characterized by high potential for unrecorded heritage resources or which contain at least one recorded site that might be impacted, but site status has not been confirmed.
- High - those routes containing recorded sites with moderate or greater significance that may be impacted; or in which a considerable portion of the route is typified by moderate or greater potential for unrecorded heritage resources.

1989 NETWORK

KELLY LAKE (AB) - 6.0 KM

The Kelly Lake (AB) segment follows the southeast side of the existing transmission line corridor. There are four sites in the vicinity: two are located between the Kelly Lake substation and Cutoff Creek (EgRk 7 and 8) and two are south of the creek (EgRk 9 and 10). EgRk 7 is characterized by intact buried deposits; it is located east of the existing transmission corridor. Beneath the existing corridor, EgRk 8, a lithic scatter, is located on the remains of a disturbed esker; some shallowly buried deposits are evident. No change in the status of these sites was noted in 1989 and the original evaluation of high and moderate (respectively) is supported. South of the creek, EgRk 9 is a possible camp with buried intact deposits; it is located west of the existing corridor. Further west, EgRk 10, is characterized by structural remains (historic homestead) and sparse surface lithics. The original assessment of high and moderate (respectively) are again supported.

EgRk 8 is located within the existing corridor and EgRk 7 is east of it. Either of these sites could be impacted during construction of 5L46 which would be to the southeast of the existing lines; eastern access could also result in impact at EgRk 7. EgRk 9 and 10 are west of the existing corridor and would only be impacted directly if access was to the west rather than the east. Due to its high visibility, historic site EgRk 10 could be indirectly impacted regardless of route or access selection; in monitoring of the condition of the structural remains should be carried out to ensure that they are not accidentally impacted.

Cultural material was noted on the surface of all four sites. A formed biface fragment was collected from EgRk 8. In addition, an isolated find of very fine-grained black basalt (siliceous chert) was noted at the western end of the disturbed ROW on the second terrace south of Cutoff Creek. Although there is not sufficient data to record it as a site, it does suggest that this area was also utilized. Isolated finds are assessed as having no heritage resource value once they are reported and, although direct impact may occur, the site is not of further concern.

A high overall impact potential rating has been assigned to segment AB because recorded heritage sites with moderate and high significance could be affected.

PAVILION (BCEF) - 29.3 KM

The Pavilion (BCEF) segment has been sub-divided into three sections for the purposes of this discussion: Pavilion Plateau (BC); Fraser River (CE); and Bridge River Area (EF).

A high overall heritage impact potential rating has been assigned to segment BCEF reflecting the high resource potential in each of the sections.

Pavilion Plateau (BC)

In 1982, six sites were recorded on the Pavilion Plateau. Two are located adjacent to an existing access road and four are within or adjacent to existing transmission lines; all six are on Gillon Creek, the only year round water source in this area. From north to south these sites are EfRk 32, EfRk 31, EfRk 35, EfRk 36, EfRk 33 and EfRk 34. EfRk 32 was assessed as having very high heritage significance as it was characterized by circular depressions associated with an old road and trail network. The site is still intact and this assessment is supported by the 1989 investigations; considerable lithic debris was evident on the trail and in the roadway. EfRk 31, an isolated find, was assessed as having no value; additional traverses in 1989 failed to yield any cultural material and thus this 1982 assessment is supported. Both sites would be impacted directly by use of the southeast side of the existing corridor.

EfRk 33 and 34 are located within the existing corridor and have been disturbed by farming activity. The former is north of Gillon Creek and extends well west and east of the existing ROW. Pockets of concentrated cultural material were noted including formed tools and microblades. EfRk 34 appears to be less extensive and is within established ROW. Both sites were assessed as having moderate heritage resource significance. However, the 1989 investigations suggest that EfRk 33 is more extensive than was originally estimated and that concentrated pockets of cultural material are more intensive. It is also highly likely that the site has experienced less farm-related disturbance than was previously predicted (Termuende, pers. comm. 1989); its significance is therefore raised to high. Portions of this site are within the new route and could be directly impacted; direct or indirect impact could occur in other portions of either of these sites.

EfRk 35 is located west of Gillon Creek and is dissected by an existing farm and/or BC Hydro access road. EfRk 36 is on the east side of the creek. Use of this road has resulted in the exposure of considerable cultural material. Examination in 1989 indicates EfRk 35 is larger than was originally estimated and is likely characterized by more concentrated cultural remains; the site evaluation was upgraded to high from moderate. Conversely, EfRk 36 has seen recent disturbance (historic remnants were burned) as a result of clean-up and reconstruction of an irrigation ditch. The site essentially has been destroyed by these activities. Although a formed biface fragment was collected in 1989, no other cultural material was evident. It is recommended that the low significance assigned in 1982 be dropped to no value. Use of the farm road as an access route could result in direct or indirect impact at both sites.

Two new sites were located in 1989: EfRk 44 and EfRk 45. Both are located adjacent to a farm and/or BC Hydro access road and within the existing transmission line ROW. EfRk 44 is located on a low terrace north of Gillon Creek and is approximately 100 m southwest of EfRk 32. The site has been extensively disturbed by transmission line construction and more recently by intensive rodent activity. Considerable cultural material was noted on the surface; a number of formed tools were collected. EfRk 45 is south of Gillon Creek and east of the eastern limit of EfRk 44. It is located on a terrace remnant which is slightly higher than the low terrace adjacent to Gillon Creek. Sparse cultural remains were noted on the surface and in rodent exposures; it too has been extensively disturbed. The disturbance evident at both sites suggests that the former (with more surface material evident) should be assessed as having low heritage resource significance and the latter (sparse cultural material) as having no value. Both sites could be directly or indirectly impacted by construction on the southeast side of the existing corridor or for access purposes. As this area was densely forested prior to construction of the transmission corridor, more intensive disturbance has occurred than is typical of other sites on this plateau.

In addition to these two sites, an isolated find was encountered within the transmission corridor and south of the access road which dissects EfRk 35 and EfRk 36. A single unworked flake of basalt was noted on a small knoll (one of several that form a semicircle) overlooking an intermittent drainage basin. Although it is not sufficient cultural information to justify recording as a heritage site, it does suggest the whole plateau area (particularly adjacent to extant or extinct water sources) may have been utilized in the past.

A promontory at the southwestern end of Pavilion Plateau yielded a heritage site, EfRl 31. It is a lithic scatter with potential for intact buried deposits, but due to disturbance, it was assessed as having moderate significance. Unfortunately, it was not possible to revisit this site in 1989 as it is located on private property for which permission to cross was not available. A low level overflight suggests the site, which is primarily within and east of the existing transmission corridor, has not been disturbed since 1982; direct and indirect impact would likely occur at this site with use of the southeastern side of the existing corridor (access or construction activity).

A high overall impact rating has been assigned to section BC because recorded heritage sites with moderate, high and very high significance could be affected.

Fraser River Section (CE)
Two sites, EfRl 32 and EfRl 33, located in 1982 on the east side of the Fraser River could not be revisited as they are situated on private property. A low level helicopter flight suggests they are still intact. EfRl 32 is a lithic scatter/outlook; the physiographic and cultural characteristics resulted in a high heritage assessment. As no recent disturbance has occurred, this assessment is supported. EfRl 32 is near the existing ROW and direct/indirect impact would be possible. EfRl 33 is an historic cable car landing. Although some structural remains are evident, most are disturbed and have been assessed as having low heritage significance. The site as viewed from the air appears to be the same so that this assessment is supported. EfRl 33 is well outside (north) of the route.

The cable car landing (EfRl 34) on the west of the Fraser was also assessed as having low heritage resource significance; it was not revisited as it is well outside (north) of the route and is too low on the Fraser to be impacted by access or construction activities. The condition of this site, viewed from the air, has not changed since 1982.

Two of the sites located on the west side of the Fraser in 1982 are southeast of the route: EfRl 36 and EfRl 37. Both are lithic scatters with potential for buried intact deposits. The yield at the latter was high and the former moderate. They are located on terrace remnants west of a gully; the terrace to the east of this gully contains heritage site EfRl 19, a village site with circular cultural depressions (housepits and cache pits). All three sites are intact. In 1982, a small stemmed biface was collected from EfRl 37. Although it is similar in style to others noted in the Upper Middle Period (Sanger, 1970), it may be from a later period. In 1989, the basal fragment of an expanding stem corner-notched point was collected from EfRl 36. It also appears similar to specimens from the Upper Middle Period. It is comparable to Plateau Horizon points as described by Richards and Rousseau (1987). The two sites may actually represent one activity area and could be related to the village site at EfRl 19. Although some wind erosion and road use has exposed cultural material, all three sites are intact and the 1982 assessments of high (EfRl 36 and 37) and very high (EfRl 19) are supported.

EfRl 19 is located well away from the route and is outside of any logical access road. EfRl 36 and 37 are also sufficiently distant from the route, but are dissected by an existing access road which may be upgraded to provide access to the route (existing BC Hydro access is a series of switchbacks down the established ROW). In addition, all three sites could be indirectly impacted if not protected.

An interesting discovery was made between these three sites and the existing corridor (potentially within the segment BCEF route). A moderately sloped landform northwest of the gully bordering these sites yielded a number of surface finds. Two possible and three definite flakes of basalt were encountered; they were widely scattered and exposure was excellent. It is unlikely that buried or significant cultural material is present. Although the yield is small, it is sufficient to identify this landform as a site designated as EfRl 45. The site is assessed as having low heritage resource significance. It should however, be acknowledged that it is further support of the theory postulated in 1982 (Bussey) that the Fraser River Valley is essentially wall-to-wall site. Heritage resources are being located on landforms that are generally assessed as having low potential. This site appears to be within the route lying adjacent to the southeast side of the existing corridor. It also is crossed by the farm/BC Hydro access road that dissects EfRl 36 and 37.

EfRl 30, an isolated find located on the east side of the Fraser, was not revisited as it was sufficiently distant from the route. It has been included on the route maps to ensure it would not be impacted during access construction. Other recorded sites in this vicinity, discussed in the 1982 report, were not revisited as they are located at some distance from the route: EfRl 16, EfRl 17, EfRl 18, EfRl 20 and EfRl 21. The location of these sites is indicated on the maps to ensure they are not impacted by access or ancillary development. Others were located in the vicinity of the crossing suboption (CDE) discussed subsequently.

A high overall potential impact rating has been assigned to section CE because a recorded heritage site with high significance could be affected.

Bridge River Area (EF)
The final portion of segment BCEF ascends the steep slopes on the west side of the Fraser Valley and crosses a plateau in the Camelsfoot Range to terminate above the Bridge River Valley. Two sites located on a plateau north of the Bridge River - EeRl 187 and EeRl 188 - were recorded during the 1982 investigations and were revisited in 1989. EeRl 187 is a lithic scatter with potential for intact buried deposits off the ROW (the majority of site appeared to be within established BC Hydro corridor). The yield was moderate in density and variety and it was assessed as having moderate potential. Investigations conducted in 1989 suggest that the site is more extensive than was originally proposed. Recent road construction has resulted in further disturbance and has yielded additional cultural material. For these reasons and because what is left of the site is within the route and in recognition of the uniqueness of its location EeRl 187 should be upgraded to high significance.

On the same plateau slightly north of EeRl 187, an isolated find, (EeRl 188) was recorded in 1982. The logging related disturbance that has also occurred in this area resulted in the discovery of additional cultural items including a lanceolate biface fragment. Although similar points occur throughout time, the possibility of early use must be considered. As an isolated find was encountered south of EeRl 187, it is possible that the whole plateau could be described as one site. Intact buried deposits are possibly scattered throughout the area, but appear to have the greatest potential in the vicinity of recorded site EeRl 187. It is recommended that the entire plateau north of Bridge River be upgraded and assigned moderate to high heritage resource significance. Direct and indirect impacts would occur.

A high overall impact rating has been assigned to section EF as recorded heritage sites with moderate and high significance could be affected.

FRASER (CDE) SUBOPTION - 5.8 KM

A short alternate crossing of the Fraser River was included in the 1982 investigations and revised slightly in 1989. As the Fraser (CDE) suboption studied in 1989 is located further south of the one investigated in 1982, it is highly likely that unrecorded heritage resources could be located on either side of the Fraser. As little development, beyond farming/ranching has occurred, it is highly likely that intact remnants will be encountered. In addition, due to the proximity of the Fraser River and the presence of highly suitable landforms, it is possible that very significant sites will be located. If this route, (or a slightly altered version), is selected, it would be necessary to conduct detailed heritage resource field investigations in advance of construction. As no centerline survey had been conducted, it would have been difficult to locate the exact route and it is recommended that any field investigation should follow such a survey.

On the east side of the Fraser River, six lithic scatters (EfRl 7-12), an historic homestead (EfRl 35) and a burial site (EfRl 14) are located near the route. The lithic scatters were assessed as having moderate heritage resource significance for although some disturbance has occurred (farming), there is potential for buried intact deposits. Direct or indirect transmission line or access construction impacts could occur at these sites. EfRl 35 was also assessed as having moderate heritage resource significance. It could be directly or indirectly impacted by construction access. However, as these sites are located in Pavilion Creek valley, it is possible that they could be spanned by transmission lines. Although remains from EfRl 14 have reportedly been reburied, the site must be viewed as having very high heritage resource significance as potential for additional deposits must be considered. This site would be directly impacted by transmission line construction.

On the west side of the Fraser, two recorded heritage sites are evident near the route: EfR1 1 (circular cultural depressions) and EfRl 22 (historic homestead). According to site data, the former has likely been destroyed. In addition, the site appears to be sufficiently south of the route and near enough to the river that spanning would likely occur and that access construction should not affect it. EfRl 22 is within the route. It is a large site containing structural and featural remains and is tentatively assessed as having high heritage resource significance.

A high overall impact potential rating has been assigned to suboption CDE as recorded heritage sites with possibly high (status unconfirmed) and very high significance could be affected; the potential for unrecorded heritage resources is high.

ANTOINE (BG) - 44.3 KM

The majority of the Antoine segment (BG) does not parallel an existing transmission line, so that approximate locations were investigated in 1982. Portions yielding sites were revisited in 1989 and the emphasis was on determination of site status.

One property which could not be investigated in 1982 (private property for which permission to enter could not be obtained) was still not accessible in 1989. It is located on Antoine Creek near its confluence with the Bridge River (southern portion of segment BG). Highway field investigations conducted since 1982 (Bussey, 1988), resulted in the discovery of three heritage sites and three isolated finds just west of this property. Earlier highway related reconnaissance (Arcas, 1985a) resulted in the discovery of sites east of this area; consequently there is good heritage resource potential on this property and it would have to be investigated if segment BG is selected. Investigations on the portion of segment BG south of Bridge River yielded negative results. From the south side of the Bridge River Valley to Mission Ridge, the route is characterized by low heritage resource potential and was not subject to ground reconnaissance in either 1982 or 1989.

Portions of the northern section of segment BG were subjected to detailed field assessment. In areas typified by sparse and/or low ground cover it was possible to estimate the location of the route; other portions would have to be investigated should a centerline survey be conducted.

The overall heritage impact potential rating assigned to segment BG is high.

Kelly Creek Valley

Segment BG is aligned west from node B across the north end of the Pavilion Plateau and crosses Kelly Creek valley. The east side of the valley is relatively steep and has been disturbed by construction of the BC Rail line. However, if this route is selected, it should be examined more closely. The west side of the valley, in the approximate vicinity of the crossing, contains two very large pithouse village sites. EfRk 1 and EfRl 25 may actually be one enormous site, but as they are in different Borden designation blocks, they have been assigned separate identities. Only the latter appears to be crossed by the route, but this would have to be confirmed by a centerline survey. Both sites are assessed as having very high heritage resource significance and both contain concentrations of variously sized circular cultural depressions and a wide variety of lithic items. It is possible they represent both intensive use and use through time.

EfRl 25 contains at least 80 circular cultural depressions and surface exposures have yielded a high frequency of lithic items. A dirt road runs parallel to Kelly Creek and has dissected or impacted a number of the depressions. Others are intact. A road ascending the west side of the valley also has impacted this site. The 1989 visit indicated that no disturbance had occurred since 1982. Even more cultural material was exposed as a result of road use and/or natural erosion. This site and nearby EfRk 1 could be impacted directly by transmission line or access construction and indirectly by any activity that occurs in this valley.

If segment BG is selected, the western side of the Kelly Creek Valley should be subject to a detailed heritage resource inventory and impact assessment to determine if sites are located west of EfRl 25 (and/or EfRk 1). It was not possible to determine the exact location of the route due to forest cover. It may be necessary to survey as far as Cavanagh Creek if potential is evident.

A high overall impact potential rating has been assigned to the Kelly Creek section as recorded heritage sites with very high significance could be affected; the potential for unrecorded heritage resources is high.

Fraser River

Segment BG crosses the steep slopes of Cavanagh Creek to descend towards the Fraser River. On an isolated and high landform on the east side of the Fraser, a site was located in 1982. It was unexpected as the slope was moderate to steep. It was checked as it represented one of the few landforms in the vicinity that was suitable for tower location. Access was by helicopter, which might also be required during construction. It is also possible that the line would not descend this low; it may run off a higher ridge to span the Fraser. The site, EfRl 39, was characterized by a moderate yield of surface lithics. Its strategic location suggests it could have served as a lookout and temporary camp. Tools were also noted at the site and buried intact deposits predicted; it was assigned high heritage resource significance. It was only possible to hover over the site in 1989; lithics were still evident on the surface and no obvious disturbances were noted. For this reason, the 1982 assessment is supported. The route is close to Kelly Creek IR 3 which may contain heritage resources, but the reserve is low in the canyon and 5L46 would be high above it. No impacts would occur.

The west side of the Fraser River in the vicinity of segment BG is particularly rich in heritage resources. Almost all portions yielded some type of cultural material although the yield on the lower terrace was sparse. Four new sites were recorded in 1982 and were revisited in 1989. The lowest terrace, at its northern extremity, yielded a small lithic scatter and a bone awl was collected from a trail leading to higher levels (vicinity of EfRl 38). Designated EfRl 27, it was assigned moderate potential for, although the yield was low, there was potential for buried deposits and it likely relates to other sites in the area (on trail system). It is strategically located for viewing the Fraser River north of the site and it is likely that other portions of this large terrace will yield similar clusters of lithics. It is possible that this terrace could be spanned, in which case the site would not be impacted. However, if the terrace is used for tower location, this or other as yet undiscovered sites, could be impacted directly or indirectly. During the 1989 field investigations, only one flake was noted on the surface of this site. As it is exposed and wind erosion is occurring, this was not surprising. Potential for additional cultural material to be present is sufficient to support the moderate significance assessment.

A rock outcrop separates the low terrace from a higher outcrop which has served as a barrier to colluvial movement. The area between this outcrop and the base of a ridge contains archaeological site EfRl 26. Both surface cultural material and buried artifacts that have been protected by colluvial deposits were noted at this site. Scattered items were also evident on the rock outcrops and a trail leads from this area to the lower terrace. A small log cabin likely associated with relatively recent mining activity (series of holes excavated by heavy equipment) in the area, was also located on the site. The yield was high and varied and the site was assigned very high heritage resource significance. The site is still intact and this assessment is supported by the 1989 field investigations. If this route is selected, it is highly likely that transmission or access construction could impact this site. Even increased use of the Leon Creek Road which dissects the site's western half could result in significant impacts. Additional field reconnaissance in this vicinity would be required if segment BG is used.

Two biface fragments were collected from EfRl 26 in 1982. One is indeterminate and the other is similar in style to points from the Lower Middle Period (Sanger, 1970). A formed uniface from this site was also similar to specimens from this time period. A formed biface collected in 1989 is similar to styles associated with the Upper Middle Period (Sanger, 1970) or the Plateau Horizon (Richards and Rousseau, 1987). It is possible this site represents use through time.

Attempts to determine a route that would not cross a site in this area were not successful. To the south of EfRl 26, another site was located (EfRl 28). Concentrated and scattered flakes were noted at this site and potential for buried deposits was identified. The site is less significant than EfRl 26, but more detailed investigation could result in a reassessment; the discovery of a formed biface fragment in 1989 suggests that the site yield might prove to be more varied than was expected. The site has at least moderate heritage resource significance (1982 assessment). It could be impacted by transmission line or access construction either directly or indirectly. It is currently dissected by the Leon Creek Road and any increased use could cause additional impact.

The attempt to find a site-free area north of EfRl 26 was also unsuccessful. EfRl 38 is situated at the north end and on the west side of the rock bluff above the lower terrace. Like EfRl 26, this site is partially protected by a layer of sterile deposits. Little cultural material was evident on the surface, but subsurface tests yielded concentrated artifacts. The site was assigned very high heritage resource significance in 1982. Due to the limited variety of the yield, reassessment suggests that high heritage resource significance is sufficient although evaluative testing could result in a return to the higher rating. Limited surface examination in 1989 yielded scattered cultural material throughout a dry gully located north of this site. As this gully provides access to the lower terrace (in the vicinity of EfRl 27), it is likely that other sites are located nearby; the artifacts in the gully could be the result of slope wash. EfRl 38, located north of the route and east of Leon Creek Road, is not threatened; its location should be confirmed if a centerline survey is carried out. As the deposits are primarily buried, indirect impact would be unlikely.

Further west, a steep ridge forms the eastern edge of a basin characterized by disintegration moraine deposits. There are a series of undulating landforms, small kettle lakes and extant and extinct drainage systems. Site EfR1 23, visited in 1982, proved to be considerably larger than was first recorded. In addition to a number of large and small circular depressions, localized areas of surface lithics surround the site. Although some surface disturbance has occurred as a result of fire fighting activity (pre-1982), the site is essentially intact. In 1989, it was noted that some surface erosion had occurred, but that no substantial new disturbance was evident; consequently the 1982 assessment of very high is supported. This site appears to be located north of the segment BG route. Provided access is from the south, the site should not be directly impacted but indirect impact could occur as the site is highly visible. It was difficult to determine the exact location of the route in this basin and if it is selected, a detailed basin inventory and impact assessment would be strongly recommended.

Near the western edge of the basin, it was possible to approximately locate the segment BG route because of a small, well-defined lake in the vicinity. This area was investigated and a disturbed archaeological site was located adjacent to the lake (EfRl 29). A number of small circular depressions are still intact and it is possible that this location once served as a camp or village site. However, the cultural yield is relatively low and disturbance is extensive. No additional disturbance was noted in 1989. The site was assigned no heritage resource value in 1982. As some additional cultural material was noted on the surface and there are intact depressions (cache pit size), this assessment should be raised to low.

According to the 1:50,000 scale maps, EfRl 29 is within or immediately adjacent to the route; it is highly likely that it would be impacted by transmission line and/or access road construction. A pre-1982 fire fighting road has disturbed the site and would be expected to be upgraded for use during transmission line construction.

Further west, the drainage system of McKay Creek is crossed by the route. This upland area is characterized by rock outcrops, dense forest cover and has some rugged topography. It is separated from the basin area by steep cliffs. Portions of this plateau-like area were investigated by air and ground. Although the majority of the area is characterized by low heritage resource potential, the eastern portion has low-moderate to moderate potential in localized areas. As it was not possible to determine the exact location of the route, only this preliminary heritage resource potential assessment was attempted. If segment BG is selected, and when a centerline survey has been conducted, selected portions with heritage potential should be investigated in more detail. Particular emphasis is recommended for areas adjacent to McKay Creek as it may have served as access to this area; the lower reaches of this creek contain recorded heritage sites.

A high overall impact potential rating has been assigned to the Fraser River section as recorded heritage sites with moderate, high and very high significance could be affected; potential for unrecorded heritage resources is high.

Bridge River
One high potential portion of segment BG at the Antoine Creek and Bridge River confluence could not be investigated in 1982 as landowners were unwilling to permit access; in 1988, three new sites were located near the route. Permission to investigate the route was still not available during the 1989 field reconnaissance. The three new sites were located by Bussey (1988) during a heritage inventory for the Ministry of Transportation and Highways: EfRm 4 - lithic scatter (disturbed); EfRm 5 - lithic scatter (sparse); and EfRm 6 - lithic scatter (sparse). All three are expected to be destroyed by proposed road revisions. As they were characterized by sparse cultural remains and no buried deposits, it was recommended that development be permitted to proceed with no requirement for additional heritage investigation.

Additional sites recorded in the Bridge River area are sufficiently distant from the route that inclusion in the mapping was not necessary. Because segment BG does not parallel an existing line and a centerline survey had not been conducted, additional field reconnaissance would be required if segment BG is selected. Access or ancillary developments in portions of segment BG may necessitate additional field reconnaissance.

A moderate overall impact potential rating has been assigned to the Bridge River section; although there is high potential for unrecorded heritage resources in a portion of this section, the majority has low sensitivity.

MISSION (FG) - 15.0 KM

Numerous heritage sites are recorded in the Bridge River valley, the majority of which would not be impacted by the Mission (FG) segment. Some could be spanned as they are located at low elevations and others are well outside of the route. EeRl 189, a site with circular cultural depressions, is south of the existing Bridge River road and would be spanned. EeRl 186, an historic site (pre-1940 homestead) which was judged to have high significance, was located in close proximity to the existing ROW on the south side of Bridge River but it was not revisited because it is on private property. A low-level helicopter overflight indicated that it has probably been relocated since 1982 which, if confirmed would destroy its integrity and lower its significance (it may now be located on the Duffey (FJ) segment). Due to its high visibility, this site could be impacted indirectly.

Two other recorded sites (EeRl 132 and EeRl 133) are located on the south side of the Bridge River in close proximity to existing access leading to EeRl 186. EeRl 132 is a site containing circular cultural depressions; it has been badly disturbed and contained a low cultural yield. In 1982, it was assessed as having low heritage significance. EeRl 133 is a village site with moderate yield and buried intact deposits; it is possible that a burial ground is present at this site and it was thus assigned very high heritage resource significance. As both sites were located on private property they could not be revisited in 1989. Due to forest cover, it was not possible to determine, via a helicopter overflight, whether or not recent disturbance has affected either of these sites. Further field reconnaissance would be recommended in the event that this route is selected.

The remaining portion of segment FG ascends steep slopes and proceeds across the rugged Mission Ridge terrain. Heritage resource potential was assessed as low (Apland, 1980; Bussey, 1982). It was flown in 1982 and 1989; no ground reconnaissance was undertaken.

A moderate overall impact potential rating has been assigned to segment FG although there is potential that a recorded site (status unconfirmed) could be affected, the majority has low sensitivity.

DUFFEY (FJ) - 89.0 KM

The majority of the Duffey (FJ) segment is characterized by low heritage resource potential as its route is located on steep slopes in much of both the Cayoosh and Joffre creek drainages. In this region, the route is generally located at higher elevations than was proposed in 1980 and thus lower heritage potential is evident.

Both extremities of segment FJ do have heritage resource potential; the overall impact potential rating for segment FJ is high.

Bridge River to Cayoosh Creek

From the Bridge River intersection to the high terrace of Cayoosh Creek (adjacent to top of the first highway switchback), there is moderate-high heritage resource potential. Localized areas within this stretch do exhibit lower potential, but due to the proximity of concentrated sites on the Fraser, Seton and Bridge rivers, field investigation of the majority of this portion would be required if segment FJ is selected and after a centerline survey has been conducted; the high terrace overlooking Cayoosh Creek (part of Waldon North property), the disturbed floodplain (early mining and recent renovations) of this creek and the area between and adjacent to Seton and Cayoosh creeks were subject to a series of foot traverses.

The upper terrace of Cayoosh Creek (adjacent to uppermost switchback of Duffey Lake road) has apparently served as a residence in the historic or recent past. Considerable debris (primarily tin cans and metal fragments) were scattered or dumped in this area; portions of an old wire fence was noted. Considerable disturbance in the form of heavy equipment activity and blasting has taken place recently. No evidence of structures was noted and no prehistoric material was encountered. However, if segment FJ is selected, more detailed investigation of the route should be undertaken as low-moderate to moderate potential is evident.

The floodplain area of Cayoosh Creek has been extensively disturbed in the past (historic mining) and more recently (BC Hydro campsite). An old wooden bridge and a Chinese bake oven are the only remnants of past human activity that were noted within the approximate location of the route. The former is no longer intact and is likely relatively recent. The bake oven has been included in a series of pathways constructed for tourist use and is marked by an interpretive sign. Due to the extensive disturbance that has taken place in this area, it is highly unlikely that additional intact sites would be encountered within the route, but other remnants are evident in the vicinity. Although efforts should be undertaken to ensure that the oven is not impacted, no further heritage field investigation is required in this portion of the route, provided no alignment changes are made. However,if the route is moved north of this floodplain, recorded heritage site EeRl 179 (and others even further north) could be impacted. EeRl 179, a site containing circular central depressions, would not be impacted by access or transmission line development if the present route is utilized, as it is separated from the study area by a steep slope.

In the vicinity of the Seton River, extensive disturbance resulting from railway, hydro power and spawning channel development has occurred. No heritage sites were encountered during a series of foot traverses undertaken on both sides of the Seton River. Since it is highly unlikely that intact heritage resources would be located in this area, additional investigation is not required. However, there are recorded sites along the Seton both east and west of the route crossing, so that any route change in this vicinity would require further heritage resource investigation.

North of the Seton River, the majority of the route is characterized by moderate-high to high heritage resource potential, most of which should be subject to a detailed inventory and impact assessment if this route is selected. A series of terraces and terrace remnants relating to higher levels of the Fraser River are crossed; even some shallow gullies have potential. Localized areas with steep or unstable slopes can be eliminated from the field investigations. Numerous recorded sites are evident east of this line and west of the Fraser; only three are sufficiently close to be of concern at this stage. The three were not visited, but have been included on the route maps. EeRl 28 is a pictograph and EeRl 119 and 136 are sites containing circular cultural depressions. Although none of the sites in this area appear to be on the route, locational information may not be accurate and/or access routes could threaten these or other resources in the vicinity. Selection of this route would require a detailed inventory and impact assessment study. Much of this portion of segment FJ is adjacent to an existing transmission system and it would have been feasible to conduct some field investigations. However, as the majority was located within private property, ground reconnaissance was not undertaken.

A high overall impact potential rating has been assigned between Bridge River and Cayoosh Creek as there is high potential for unrecorded heritage resources in much of this section.

Mount Currie Area

The southern end of segment FJ is also identified as having moderate to high heritage resource potential. Once the rugged uplands of Joffre Creek are crossed, the route descends to parallel 3L2 on the north side of the Birkenhead River. Five recorded sites are located at the eastern end of this section: two (EbRp 1 and 3) contain pithouse depressions (circular cultural depressions); two (EbRp 4 and 5) are pictographs; and one (EbRp 11) represents the remains of historic Port Pemberton. Attempts to spot any or all of these sites from the air (using repeated low-level helicopter overflights) were not successful due to dense forest cover. As the most feasible access was through private property, ground reconnaissance was not conducted. If segment FJ is selected, any or all of these sites could be within access or transmission line ROW. This section is judged to have high heritage resource potential. Further north, potential is slightly lower (moderate to moderate-high), but at the northern end (Birkenhead River-Owl Creek confluence area), potential is again high. If the segment FJ is selected, all portions of this section of the route should be subject to field reconnaissance.

A high overall impact potential rating has been assigned to the Mount Currie area as significant recorded sites could be affected; potential for unrecorded heritage resources is moderate-high in portions.

Cayoosh Creek to Mount Currie

The only other section of segment FJ that should be examined in more detail, if it is selected, is the portion between Cayoosh Pass and the crossing of Joffre Creek. It exhibits characteristics suggestive of low-moderate potential, but in the event higher potential landforms are crossed in the final routing, the area should be examined after a centerline survey has been conducted. If potential justifies more detailed examination, foot reconnaissance of this 3 km section (or portions) should be undertaken.

A low overall impact potential rating has been assigned between Cayoosh Creek and Mount Currie; potential for unrecorded heritage resources is low to low-moderate.

ANDERSON (GH) - 39.5 KM

The Anderson (GH) segment traverses the west side of Anderson Lake to the vicinity of D'Arcy. In 1982, three alternatives were identified at its north end; the route selected for the 1989 study does not directly impact any recorded sites and has low potential for additional resources. Along Anderson Lake, the route follows an existing ROW , but would require additional clearing. Some straightening of the existing ROW may also be required. The majority of the sites recorded prior to 1982 are located at some distance from the route and were not visited during the original or updated study (only those at the northern end of the section are shown on the series VI maps as the others are sufficiently distant from the route).

The 2L1 ROW was constructed from the railway and although old access may be used, it is possible that intact site remnants could be evident. In addition, as site frequency likely increases in proximity to the lake, it would be preferable if the railway was not used for access; this could mean that considerable new access would be required from above. As there is some upland heritage resource potential, field reconnaissance of access routes would be required.

Four new heritage sites were recorded and a documented site was visited during the 1982 investigations; each was revisited in 1989. EdRo 23 is located within the 2L1 ROW on the north side of McGillivray Creek. The majority of the site was impacted by earlier transmission line construction, but a pocket of intact buried deposits was noted at the western edge of the ROW. Remnants of a wire (telegraph/telephone) line which traversed McGillivray Creek were also noted. An old trail leads to the lake from the eastern side of the ROW and may also continue north and represent part of the Anderson Lake pack trail which was recorded further to the south. In 1982, the site was assessed as having moderate significance; the 1989 investigations support this assessment. The only change in condition is that one of the insulators could not be relocated. This site would be directly impacted by transmission line construction activities.

EdRo 24 was located on the south side of McGillivray Creek. A residence near the previous transmission line development has impacted this area. The cultural yield consists of historic mining features (flume and scattered equipment), an historic trail descending McGillivray Creek and a single flake of basalt (prehistoric). The site was assessed as having low heritage significance and the 1989 investigations did not yield any information that would dispute this rating. This site would be directly impacted by transmission line construction; portions outside of the ROW could be directly or indirectly impacted.

Further south, part of the historic Anderson Lake pack trail was encountered east of the existing ROW. A single historic find (recorded as EdRo 25) was collected from the trail. The trail was relocated in 1989 and although a little more overgrown, is still readily evident in limited areas. Although it is only a remnant, it was assessed as having moderate potential because it was so well defined and represents one of the few known portions of this trail. There is no reason to change this rating. This site would be directly impacted if additional access east of the existing corridor is required. Otherwise, it should not be impacted either directly or indirectly.

Further south, a historic homestead (Lot 4802) reported in a Heritage Conservation Branch (1980) publication was visited in both 1982 and 1989. The road leading to it has become overgrown and vegetation is infringing on the cleared areas (including an orchard). The windows have been removed since 1982 and wildlife have been using the structure. A network of trails (possibly including part of the Anderson Lake pack trail) are evident in the vicinity. Although deterioration is evident, the original assessment of very high significance is still viable. The structures are located outside of the existing ROW, but direct impact could occur to other portions of the site; indirect impact could also occur.

On a rock outcrop overlooking the south end of Anderson Lake, disturbed remnants of historic structures were encountered (EdRo 26). A number of burnt or deteriorated foundations, depressions and scattered debris were evident. The integrity of the site is essentially destroyed. The site was assessed as having no heritage resource significance and this assessment is unchanged. The eastern portion of this site could be impacted (directly) if a wider ROW is required.

A high overall impact potential rating has been assigned to segment GH as recorded sites with moderate and very high significance could be affected.

BIRKENHEAD (HI) AND OWL (IK) - 45.0 KM
The majority of the Birkenhead (HI) and Owl (IK) segments are characterized by rugged upland and/or steep slopes. Certain areas, viewed from the ground and air, are suggestive of greater potential.

The Blackwater Creek crossing is basically steeply sloped, but narrow terraces and gently-moderately sloped landforms are evident in the valley bottom adjacent to the watercourse. It is assessed as having low-moderate potential although it should be acknowledged that routing refinement could result in assessment changes. The Birkenhead River crossing south of Birkenhead Lake is characterized by landforms suggestive of moderate potential and should also be investigated in more detail if this route is selected.

Although intensive farming activity/development is evident in the Lillooet River valley crossing of this route, there is moderate to moderate-high heritage resource potential evident. Ground reconnaissance of this section should be undertaken after a centerline survey has been conducted. If the Birkenhead /Owl route is selected, the Owl Creek headwaters should be re-examined; potential for heritage resources may be evident. No recorded heritage sites are located in the immediate vicinity of the route; no systematic inventory of the area has been conducted.

A low overall impact potential rating has been assigned to segments HI and IK; although low-moderate to moderate potential is evident in portions of the former and low-moderate to moderate-high in the latter, the majority of both routes have low sensitivity for unrecorded heritage resources.

GATES (HJ) - 27.5 KM
The Gates (HJ) segment crosses a variety of landforms; all with moderate or greater heritage potential were investigated in 1982. Four sites were recorded in 1982; several previously recorded sites are located in the vicinity, but were not visited as they were either at some distance or separated from the route by the railway or highway. As these sites were generally well outside of the route, no further work was undertaken in 1989. Those located near the route have been plotted and route changes or access construction in the vicinity would require advance field investigation. Again, sites on some private properties were not visited.

A section at the northern end of segment HJ, which was not investigated in 1982, has been selected for the 1989 study. Field investigation of the route at the Blackwater Creek crossing was undertaken. No cultural material was noted, but as only the approximate location was investigated, additional field reconnaissance may be required. Emphasis was placed on a ridge complex north of the creek and east of 5L42. The use of this section avoids two sites recorded in 1982.

EdRo 27 was recorded as an isolated find. The 1989 investigations indicate that this should be upgraded to a small find-lithic scatter. The excellent exposure evident in the 2L1 ROW yielded several flakes of basalt. Testing on a terrace edge east of the ROW did not yield any additional material. As the site is no longer on the route, no further investigation was justified. Due to disturbance and the sparse yield, this site is only upgraded from no value to low heritage resource significance. It could be impacted by the removal of 2L1.

In 1982, EdRo 28 was identified as a camp with a high and varied cultural yield. Buried intact cultural material was evident in limited areas of the disturbed 2L1 ROW and in adjacent terrace deposits. The portion of the site within the route was assessed as having moderate significance. The 1989 revisit has indicated that the majority of the intact deposits within the ROW have been impacted as a result of sand removal. The cultural material within the route is thus reassessed as having low significance. However, to the east, rich deposits with little disturbance (although other portions are being actively disturbed by continued borrowing) were encountered. The potential size of the site (terrace is large) and the density of the cultural material suggests that remaining portions have moderate-high significance. This site would not be impacted by transmission line or access construction; removal of 2L1 would only further impact the extensively disturbed site. Borrowing by local residents will undoubtedly continue and has already impacted portions of the site outside of the ROW.

The selection of a higher elevation route east of Gates Lake would avoid a site recorded on the 2L1 ROW in 1982. EdRp 3, located on a fan south of Gates River, is an isolated find that was assessed as having no value and was not revisited in 1989. Removal of 2L1 could impact the site. As exposure was good and subsurface testing was undertaken, there is little chance a significant site is evident; further field investigation was not justified.

Portions of segment HJ through this area were subject to ground reconnaissance as historic activity was reported in the vicinity. A possible pack trail was encountered, but the intensive logging activity has eradicated most portions. An early road also was encountered, but there was not sufficient data to determine whether or not it was historic or relatively recent. Several short alternates between here and Gramson involve landforms with low heritage resource potential. Several creek crossings and elevated landforms were investigated; no cultural material was noted.

South of Gramson, the majority of the recorded sites are sufficiently distant from the route (many are separated from it by the highway and/or railway - eg. EcRq 1, EcRq 2, EcRq 3, EcRq 9, EcRq 11 and EcRq 12). Some could not be relocated because of insufficient site data (EcRq 7 and EcRq 8) and others were located on or required restricted access through private property (eg. EcRq II, 12 and 13). Some additional field investigation would be required in this vicinity if segment HJ is selected.

A lithic scatter recorded in 1982, EcRq 14, was revisited; there is no change evident at this site. It is located within the 2L1 ROW and has been extensively disturbed by previous transmission line development and gravel borrowing. The site was judged to have no significance in 1982; this is supported by the 1989 investigations - only a light scattering of lithics was evident.

A low overall impact potential rating has been assigned to segment HJ; one recorded heritage site with low significance would be impacted, but the majority of the segment has been inventoried with negative results.

RYAN (IM) - 57.0 KM

The majority of the Ryan (IM) segment is characterized by low heritage resource potential (high elevation, rugged terrain, steep slopes); some portions however, have sufficient potential to justify field investigation if this route is selected. Field reconnaissance should be undertaken after a centerline survey is conducted.

The vicinity of the Birkenhead Lake, Birkenhead River and Tenas Creek areas (approximately 2 km from node I), is judged to have low-moderate to moderate heritage resource potential. Portions of this area were examined from the ground and although the dense forest cover inhibited determining the exact location of the route (and will inhibit the discovery of small heritage sites), suitable landforms were evident and other characteristics suggestive of heritage potential (accessibility, proximity to water, natural resource availability) were noted. The section crossing the Lillooet River valley has moderate to moderate-high (greatest in close proximity to the river) heritage resource potential. The vicinity of the Soo River crossing (accessible only from air at this time) was also suggestive of slightly higher (low-moderate) heritage resource potential. Well defined and apparently well drained terraces were evident at this crossing which is not the case further east (Soo/Rainbow route crossing). No recorded heritage sites are located in the vicinity of this section of segment IM; no detailed heritage resource investigations have been conducted in this area.

A low overall impact potential rating has been assigned to segment IM; although low to moderate-high potential is evident in portions, the majority of this segment has low sensitivity for unrecorded heritage resources.

PEMBERTON (JK) - 10.0 KM

Only one recorded heritage site was reported sufficiently near the Pemberton (JK) segment to justify field investigation. Attempts to locate this site, EcRq 10, were unsuccessful. Locational information was sufficient, but development of the area for a residence and shop has resulted in extensive disturbance. It is believed that this site has been destroyed. As such, it has no heritage resource significance. The location on which it was situated could be impacted by transmission line and/or access construction. This short segment, which includes the Lillooet River valley crossing, was investigated in 1982. As there are no route changes and no heritage resources were located, additional investigation in 1989 was not deemed necessary.

A negligible overall impact potential rating has been assigned to segment JK; a detailed inventory was conducted with negative results (one previously recorded site has been destroyed by development).

GREEN (KL) - 2.0 KM

The short Green (KL) segment is located primarily on slopes characterized by low heritage resource potential. The northern end in the vicinity of Nairn Falls was investigated in 1982. As no heritage resources were located, further reconnaissance was not required. However, if a new crossing of Green River is required, field investigation should be undertaken after a centerline survey has been conducted.

A negligible overall impact potential rating has been assigned to segment KL; a detailed inventory was conducted with negative results.

SOO (LM) AND RAINBOW (MN) - 41.0 KM

The Soo (LM) and Rainbow (MN) segments are slightly longer than a similar route proposed in 1980 (Apland). The majority of segments LM and MN are characterized by low heritage resource potential (rugged uplands, steep slopes, waterlogged deposits). Limited portions are suggestive of sufficient potential to justify field investigation if this route is selected.

Field reconnaissance of several portions of this route was undertaken, but was restricted to foot traverses and an overview assessment of landforms as the alignment could not be determined (dense tree growth). Although the Green River vicinity has potential landforms, there is also considerable disturbance evident (including a garbage dump) and thus moderate potential is predicted. The Soo River crossing is only marginally interesting as the area is primarily waterlogged or characterized by steep slopes. However, the presence of localized landforms that appear to be well drained and level suggests that some areas with heritage potential (low-moderate) could be crossed if this route is utilized. The crossings of Callaghan and Brandywine creeks are also suggestive of slightly higher potential (low-moderate) than the rest of this route.

A low overall impact potential rating has been assigned to segments LM and MN; although low-moderate to moderate potential for unrecorded heritage resources is evident in the former and low-moderate in limited portions of the latter, the majority of both have low sensitivity. The remaining portions are assessed as having low heritage resource potential.

WHISTLER (LN) AND UPPER CHEAKAMUS (NP) - 49.8 KM

A number of revisions between Nairn Falls and Butterfly Lake, which were not investigated in 1982, have been selected for the 1989 route. The majority are located at higher elevations and on landforms with less heritage potential than the original route. However, several river crossings have been revised and a physical overview of these was undertaken to determine the heritage resource potential. It was not feasible to conduct detailed field investigations as the crossings do not parallel existing systems and no centerline survey has been conducted.

The crossing of Daisy Lake near the confluence of Brandywine River was investigated and does not require further work, nor do portions of the route in the vicinity of Green Lake or Lake Lucille. The two proposed crossings of the Cheakamus River (near Whistler and in the vicinity of Brandywine Falls), should be investigated if a centerline survey is conducted. The Cheakamus River crossings adjacent to existing lines were sufficiently investigated in 1982.

The Whistler area crossing of the Cheakamus River is located near heritage site EaRs1 recorded in 1982. This site was revisited; no cultural material was encountered confirming the original description of a disturbed lithic scatter. The original assessment of moderate significance is changed to low in light of the limited yield and disturbed nature of the site. However further investigation should be undertaken at this vicinity if any variation of the river crossing is proposed.

A low overall impact potential rating has been assigned to segments LN and NP; although one recorded site is located in segment LN, it has low significance and the remainder of the route has been inventoried; moderate potential is evident in limited portions of segment NP, but most has low heritage resource sensitivity.

LOWER CHEAKAMUS (PQRT) - 13.7 KM

After completion of the draft heritage update report (fall 1989), BC Hydro revised a portion of the Lower Cheakamus (PQRT) segment. The original study (Bussey, 1982) involved use of the 2L1 ROW. The initial 1989 investigations included the 2L1 ROW, minor deviations from it, and a suboption (RST) which was intended to bypass the North Vancouver Outdoor School and the Cheakamus Indian Reserve. The original suboption (South) is referred to as RST; the two new suboptions are PR (West) and QS (East).

Suboption PR leaves the existing corridor in the vicinity of Butterfly Lake. It traverses rugged terrain west of the Cheakamus River and crosses the river just north of node R. Suboption QS involves a more northerly crossing of the Cheakamus. It traverses the east side of the river to node S which is south of Brohm Lake.

Node S, which could be used for any of the Lower Cheakamus suboptions, is located south of the only recorded heritage site in this area (two other sites in the Squamish area have been assigned site numbers, but data is too vague to permit accurate determination of their locations). DkRs 3 is a mythological site, reported by a local informant. The native name for it is "Wountie" and it is associated with another myth site located in the river (which has not yet been recorded). DkRs 3 is a natural stone face or exposure. This is the location were one of two brothers tried to hide from the Transformer. The Transformer knew where he was however, and changed him to stone. This stone face "watches over the river and the salmon coming up the river" (site form data, Archaeology and Outdoor Recreation Branch). The other brother was turned into a stone in the river. DkRs 3 is judged to have considerable heritage resource significance.

When these suboptions (PR and QS) initially were identified, a preliminary assessment of the heritage resource potential was made. This assessment was based on background research and topographic map interpretation. As a centerline survey has not been conducted, it was not feasible to conduct a detailed inventory and impact assessment. However, the proximity of one of the new routes to recorded site DkRs 3 was sufficient justification for limited field reconnaissance. The area was visited in order to determine the approximate location of the site and its physical characteristics. The presumed location of the site was viewed from the Cheakamus River valley. There are numerous exposures evident, but one specific location appears to be the most likely; it is visible from the valley and overlooks the river. As it represents a vertical face, it is unlikely that transmission line construction would physically impact this site. It is possible that visual impact could occur. However, if the line is located behind (east of) the ridge containing DkRs 3, visual impact would not likely occur.

As field investigation of the new routes is not feasible without a centerline survey, they are less desirable in heritage terms than use of the 2L1 ROW. However, as they have been identified as possible alternates, it was necessary to conduct a preliminary assessment of potential to make comparison possible.

A low overall impact potential rating has been assigned to segment PQRT; a detailed inventory of the majority of the route has been conducted with negative results, but a possible new crossing of Cheakamus River has moderate potential. However, the south (RST) suboption has moderate impact potential primarily because of crossings of both the Cheakamus and Cheekye rivers.

West (PR) and East (QS) suboptions

The majority of the west (PR) suboption is typified by low heritage resource potential as it is located in rugged terrain inland of the west side of Cheakamus River and no tributaries would be crossed. Use of this route would involve a new crossing of the Cheakamus River. Moderate potential for heritage resources is predicted for this vicinity. Detailed field reconnaissance of this location is recommended if suboption PR is selected. A series of foot traverses, in conjunction with subsurface testing, would be required.

A low overall impact potential rating has been assigned to the suboption PR; limited portions have moderate potential for unrecorded heritage resources, but the majority is typified by low sensitivity.

Use of the east (QS) suboption would also involve a new crossing of the Cheakamus River. This locality has been assigned moderate heritage resource potential; detailed field reconnaissance, conducted after a centerline survey would be required if suboption QS is selected. The majority of the route is located on steep slopes and/or in the interior of terrain units and is typified by low heritage resource potential. Final route selection in the vicinity of the proposed tributary crossings might involve landforms with higher heritage resource potential. These locations would have to be viewed through topographic and aerial photograph interpretation and/or helicopter/ground reconnaissance. If sufficient heritage potential is evident, detailed field reconnaissance would be required at the tributary crossings as well as at the river crossing. In addition, this route is located very near recorded site DkRs 3 and although physical impact is not likely, visual impact could occur.

As there is potentially higher heritage resource sensitivity (because of the presence of tributaries and western exposure) along suboption QS and because of its proximity to recorded site DkRs 3, there is a strong preference for PR over QS. However, it should be emphasized that this preference is based on limited data and that field investigation of portions of either route would be required to ensure unrecorded heritage sites are not impacted. It should be reiterated that use of the existing corridor through this area would be preferred over any of the three suboptions.

A moderate overall impact potential rating has been assigned to suboption QS; there are a number of locations with low-moderate to moderate heritage resource potential and a recorded site (status unconfirmed) is located nearby.

1990 ALTERNATIVES

ORE (UV) SEGMENT - 38.0 KM

Much of the Ore (UV) segment is characterized by low heritage resource potential as it is located on steep slopes and/or in the rugged interior of an upland area. The eastern end (near node V) is located in an area with high heritage resource potential and appears to cross heritage site EfR1 23. This is a village site that was assessed during the 1982/84 (Bussey; Cypress) and 1990 (Bussey) as having very high heritage resource significance. Although portions of the surface have been disturbed by fire-fighting activities and use as a temporary sawmill site, the majority of the depressions are intact or minimally disturbed. Surface examination in June, 1990 indicated that the site had not been disturbed since 1989; numerous artifacts were evident on the surface of this site. Two were collected: a formed biface (late period style of projectile point) of fine grained black basalt and an incomplete ground stone tool (adze-like) of green jadite. The basin containing this site is judged to have high heritage resource potential or sensitivity and a detailed inventory of all portions would be required if segment UV was selected.

West of this basin is an upland area drained by McKay and Leon creeks. In 1989/90, the eastern portion of the Antoine (BG) segment in this area (especially near McKay Creek) was noted to have potential for heritage resources. The proximity of segment UV to McKay Creek suggests the eastern end in this upland area also has low-moderate to moderate heritage resource potential.

Those portions of segment UV close to Ore Creek and the Yalakom and Bridge rivers are also judged to have considerable heritage resource potential. Within the Ore Creek drainage, small areas containing landforms with moderate potential are evident, and the area of the Yalakom confluence has high heritage resource potential as does the Yalakom crossing site. Landforms adjacent to creeks and some elevated benches along the west side of the Yalakom River, along segment UV, have moderate potential for heritage resources. In the vicinity of the Bridge River crossing, there are well defined terraces with high heritage resource potential, but the route appears to be west of these landforms.

If segment UV is selected, it would be necessary to conduct a detailed heritage resource inventory and impact assessment reconnaissance of the basin containing EfR1 23, the eastern portion (McKay Creek vicinity) of the upland, and selected portions of the Ore Creek drainage and Yalakom and Bridge river areas. This reconnaissance should be conducted after a centerline survey has been completed in order to ensure that the correct route is investigated. Only EfR1 23 is known to be located in the immediate vicinity of segment UV, but no systematic survey has been conducted.

A high overall rating has been assigned to segment UV as a highly significant recorded site could be affected and potential for unrecorded heritage resources is moderate-high in several portions of the route.

BRIDGE (F1X) SEGMENT - 19.7 KM

The majority of the Bridge (F1X) segment is located in rugged upland and has little heritage resource potential. However, the western end (near node X) is located in an area which may have high potential. At its eastern end, the segment F1X is located on the west side of the Fraser River in a rugged area with little heritage resource potential. However, if segment F1X is selected, this should be confirmed.

The crossings of Applespring Creek and a tributary to it (near the central portion of segment F1X) appear to have low heritage resource potential as they are characterized by steep slopes. However, if segment F1X is selected, this should be confirmed as heritage potential does exist within this drainage. Recorded site EeRm 8 is located on Applespring Creek (Map VI-1W). The vicinity of node X was previously identified as an area with high heritage resource potential (see Antoine (BG) segment discussion). This assessment is supported by the more recent review, but should be confirmed by field investigation. If segment F1X is selected, more detailed examination of both ends and the Applespring Creek crossing would be required; if potential is sufficient, field reconnaissance should be undertaken, after a centerline survey has been conducted.

A moderate overall impact potential rating has been assigned to segment F1X, although potential for unrecorded heritage resources is generally low, one short portion exhibits high sensitivity.

EAST (WW1DE) AND SOUTH (W1F1) PAVILION SEGMENTS - 20.3 KM

Both East (WW1DE) and South (W1F1) Pavilion segments have considerable heritage resource potential and there are recorded sites in the vicinity of each.

Segment WW1DE leaves the existing corridor at the south end of the Pavilion Plateau and rejoins it on the west side of the Fraser at node E. The crossing of Pavilion Creek would not impact any recorded heritage sites, but four sites (EfRk 6, 30, 41 and 42) are located to either side and could be impacted by ancillary development and/or access. However, it is highly likely that this valley bottom and these sites could be spanned. The upland areas on either side of this valley also have heritage resource potential and are not known to have been systematically surveyed. The Pavilion Plateau portion has high heritage resource potential and much of the south side has moderate potential although it is limited to specific locations (ie. those that are level to gently sloping).

Within the Fraser River valley portion of segment WW1DE there are two recorded sites evident near the route: EfRl 1 (circular cultural depressions) and EfRl 22 (historic homestead). According to site data, the former likely has been destroyed. In addition, the site appears to be sufficiently south of the route and near enough to the river that spanning would likely occur and that access construction should not affect it. EfRl 22 is within the route and it is a large site containing structural and featural remains and is tentatively assessed as having high heritage resource significance. In addition, as segment WW1DE has not been subjected to detailed ground reconnaissance, there is high potential for undiscovered heritage resources.

The South Pavilion (W1F1) segment diverges from segment WW1DE in the upland area south of Pavilion Creek; limited portions of this upland have moderate heritage resource potential. There are no recorded heritage sites along this route in the Fraser River valley portion, but one (EeRl 9) is located immediately north. It has been plotted (Map VI-1 West) to ensure it is not impacted by ancillary developments and/or access. It should be noted that there are other sites in this valley that have not been indicated as they are sufficiently distant from proposed routes. In addition, the east side of the river has high potential for unrecorded heritage sites. The west side, near F1, appears to be typified by steep slope and limited potential, but this should be confirmed if this segment is used.

A high overall impact potential rating has been assigned to segments WW1DE and W1F1; both have portions with moderate-high potential for unrecorded heritage resources; a recorded site (status unconfirmed) could be affected with use of segment WW1DE.

SETON (G1G2) SUBOPTION - 5.5 KM

The Seton (G1G2) suboption is virtually identical to a short alternate reviewed in the 1982/1984 assessment. It is located on steep slope north of Anderson and Seton lakes and has low heritage resource potential.

A low overall impact potential rating has been assigned to suboption G1G2 because low potential for unrecorded heritage resources is evident.

D'ARCY (H1H2) SUBOPTION - 15.5 KM

The relatively long D'Arcy (H1H2) suboption crosses one recorded site (EdRo 19) and is located near two others (EdRo 4 and 18). However, all three sites are on the lakeshore and would be spanned as the towers would be set high above the lake. As investigations conducted in 1982 yielded a number of sites in upland portions of the Anderson (GH) segment, there is potential above the lakeshore. It is predicted that undiscovered heritage sites could be encountered on suboption (H1H2) to the north (high potential, but recently logged) and south (moderate potential) of Anderson Lake. In addition there is low-moderate to moderate potential for sites in the central and southern portions of this suboption in the vicinity of crossings of Young John, Haylmore and Spruce Creeks and three unnamed streams to the south. The southern terminus is located on steep slope and is suggestive of low heritage resource sensitivity.

A moderate overall impact potential rating has been assigned to suboption H1H2; several portions exhibit low-moderate to high potential for unrecorded heritage resources and one recorded site (status unconfirmed) could be affected.

LOKLA SUBOPTION - 1.0 KM

The short Lokla suboption is on the valley floor east of the Lokla IR. However, as it represents a deviation from the Gates (HJ) segment of the network which was examined in detail in 1982, there is high potential for heritage resources in the vicinity of the new Birkenhead River crossing represented by this suboption (south end of the suboption). In addition, there are a number of recorded sites located in this vicinity. If the Lokla suboption is selected, the south end should be examined in detail and the previously recorded site locations and their status confirmed.

A moderate overall mpact potential rating has been assigned to the Lokla suboption as a limited portion exhibits high potential for unrecorded heritage resources.

FUNCTION (Y1Y) SUBOPTION - 3.3 KM

Use of the short Function (Y1Y) suboption would avoid recorded site EaRs 1 which is located in the Whistler section of the existing corridor. However, it would also involve a new crossing of the Cheakamus River which could have moderate heritage resource potential (provided disturbance is not too extensive/intensive). Because of development, it is unlikely that other portions of the Function suboption have sufficient heritage resource potential to justify detailed field investigation. However, the portions of suboption Y1Y that parallel Miller Creek, using the 2L1 ROW are tentatively identified as having low-moderate heritage resource potential; a more accurate assessment should be undertaken if this route is selected.

A low overall impact potential rating has been assigned to suboption Y1Y; although limited areas have low-moderate to moderate potential for unrecorded heritage resources, the majority has low sensitivity.

CALLAGHAN (N1Y2) SEGMENT - 6.7 KM

The Callaghan (N1Y2) segment diverges from the Rainbow (MN) segment and travels in a southeasterly direction to the east side of Cheakamus valley. It then turns south and intersects with the High Cheakamus (YZT) segment. The majority of the segment N1Y2 route is characterized by rugged topography and low heritage resource potential. The Cheakamus River crossing is, however, characterized by moderate heritage resource potential. In the event segment N1Y2 is selected, it is recommended that a detailed heritage resource inventory and impact assessment of the Cheakamus Valley area be conducted after a centerline survey has been completed.

A low overall impact potential rating has been assigned to segment N1Y2 the majority has low sensitivity although one limited area with moderate potential for unrecorded heritage resources was identified.

HIGH CHEAKAMUS (YZT) SEGMENT - 36.6 KM

The majority of the High Cheakamus segment (YZT) is characterized by low heritage resource potential as it is located in a rugged, upland area. The crossings of the Brohm (lower crossing) and Cheekye rivers, however, have sufficient potential (moderate) to justify field investigation, if segment YZT is used; a final alignment across Marble Creek and the upper Brohm River should be examined in more detail through an overflight and/or aerial photograph interpretation. If localized areas with potential are encountered, field reconnaissance should include these areas.

A low overall impact potential rating has been assigned to segment YZT; although limited areas with low-moderate to moderate potential for unrecorded heritage resources have been identified, the majority has low sensitivity.

PINECREST (Y1N2P1) SEGMENT - 21.6 KM

A portion of the northern end of the Pinecrest (Y1N2P1) segment would parallel transmission lines in an area characterized primarily by slope and rugged terrain. One area with low-moderate potential, the crossing of Callaghan Creek, has been identified within segment Y1N2P1. The eastern (Y1YN2) suboption is also characterized primarily by low heritage resource potential and parallels an existing transmission line (5L42) for much of its length. However, it involves a new crossing of the Cheakamus River that has moderate heritage resource potential. The majority of the shared portion of the route is also typified by slope or rugged terrain; the crossings of Brandywine and Roe creeks are tentatively identified as having low-moderate heritage resource potential. In addition, a new crossing of the Cheakamus River is involved and this vicinity has been assigned moderate heritage resource potential. In the event segment Y1N2P1 is selected, it is recommended that these crossings be examined in more detail and, if potential is sufficient, be subjected to detailed field investigation after a centerline survey has been completed.

Segment Y1N2P1 was identified as a alternative for a portion of the High Cheakamus (YZT) segment. As the Pinecrest segment involves either one or two new crossings of the Cheakamus, it is identified as being less preferable, from a heritage perspective, than is the relevant section of segment YZT which only contains one limited area with low-moderate sensitivity.

Although limited areas with low-moderate to moderate potential for unrecorded heritage resources have been identified, a low overall rating has been assigned to both segment Y1N2P1 and suboption Y1YN2.

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MAP SERIES VI

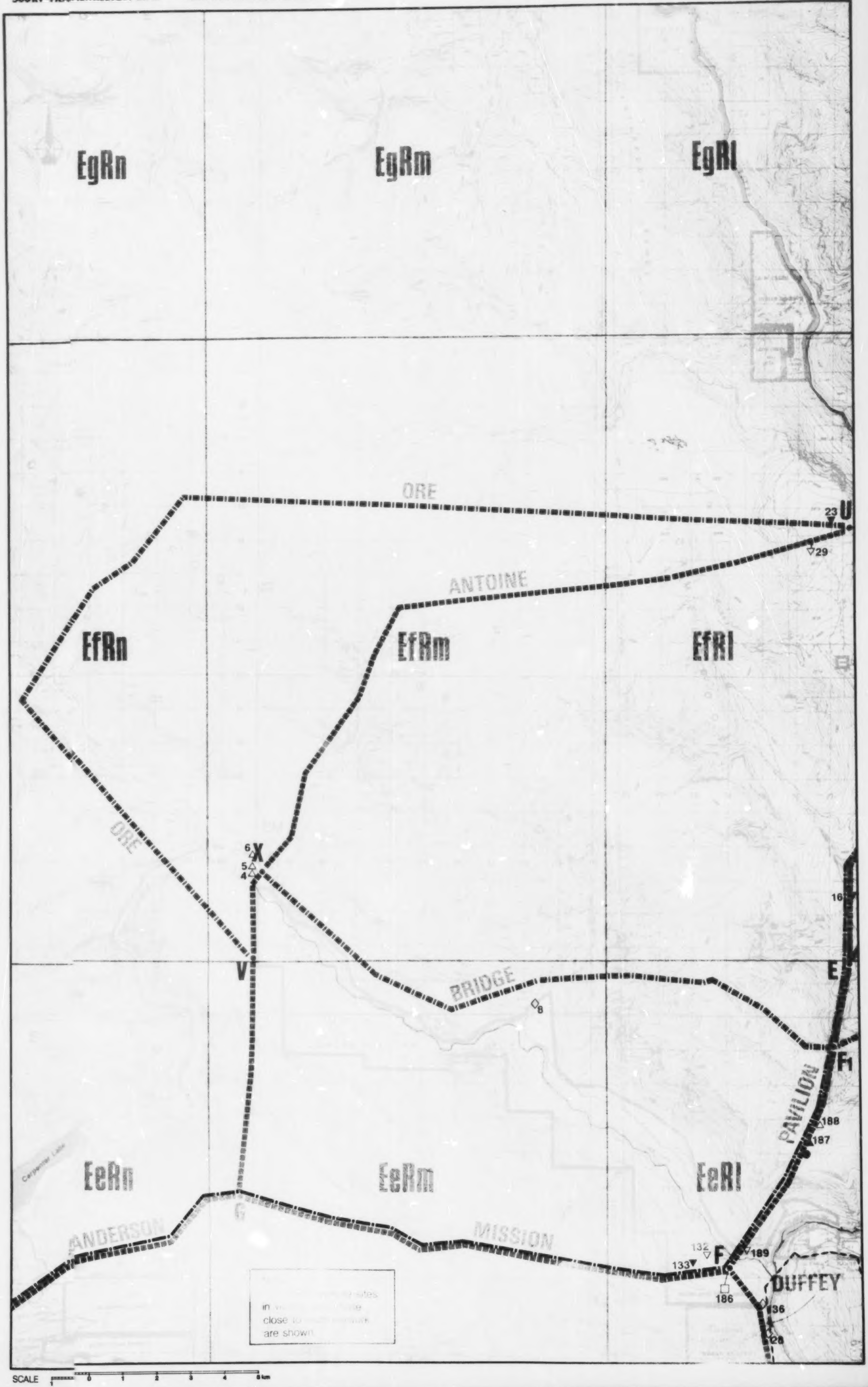
Heritage Resources

Camelsfoot	**1 West**
Fraser River	**1 East**
Bridge River	**2**
Cayoosh	**3**
Anderson	**4 North**
Duffey	**4 South**
Gates River	**5**
Pemberton Valley	**6**
Whistler	**7**
Cheakamus	**8**

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

CAMELSFOOT

HERITAGE RESOURCES VI – 1 West



HERITAGE RESOURCES

Map Series VI

LEGEND

TRANSMISSION SYSTEM

EXISTING

◆··◆··◆··◆	2L1 RoW - not utilized for 5L46
········	2L2
– – – – –	2L90 and 2L91
-------	3L2
▬▬▬▬	5L41
━·━·━	5L42

5L46 ROUTE ALTERNATIVES

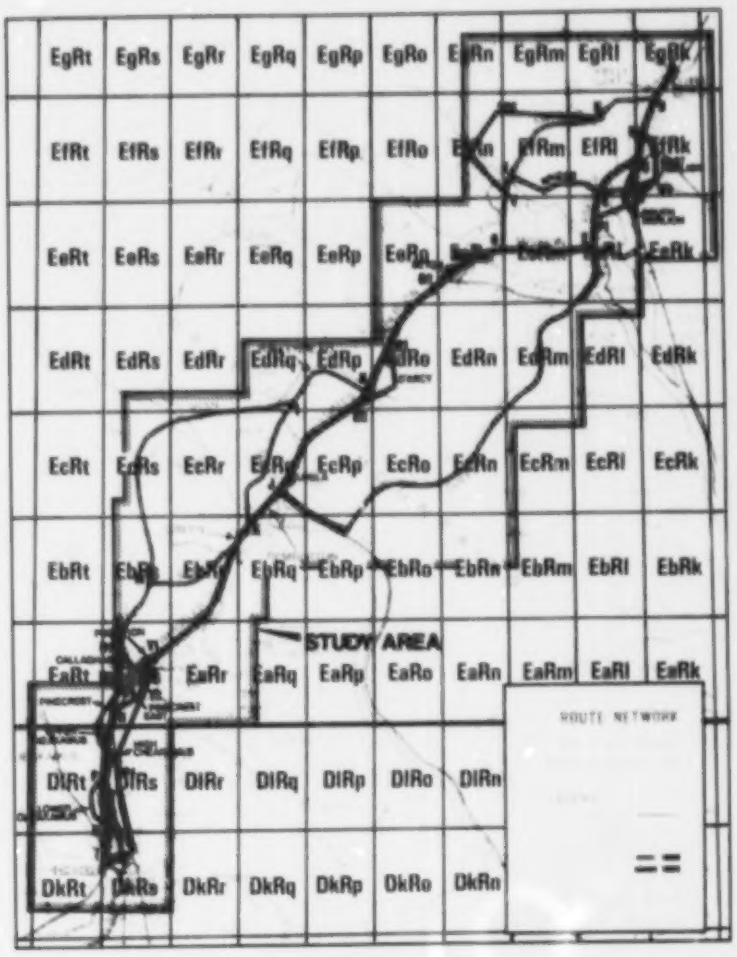
▨▨▨	1989 NETWORK - Utilizing 2L1 RoW
■■■■■	1989 NETWORK - Utilizing New RoW
■ ■ ■ ■	1989 NETWORK - Utilizing Existing Unoccupied RoW
▨▨▨	1990 ALTERNATIVES - Utilizing 2L1 RoW
▬▪▬▪	1990 ALTERNATIVES - Utilizing New RoW
•A	NETWORK NODE

HERITAGE SYMBOLS

▽	Circular Cultural Depression(s)
▼	Village
▲	Camp
△	Lithic Scatter
○	Lookout
●	Isolated Find
◆	Burial
□	Historic Structure/Homestead
■	Historic Cable Car Landing
★	Evidence of Historic Trail (Portion Observed in Field Survey)
◇	Recorded Site not Visited in 1982 or 1989/1990
⬭	Approximate Location of a Cluster of Similar Sites
EgRk	Denotes a Specific Borden Block (Borden Designation Scheme Identifies a Specific Area by a Series of Letters)
26	Recorded Site Number

Note: Symbols may be used in combinations to indicate a site for which two or more uses are tentatively identified; locations are approximate.

BORDEN BLOCK INDEX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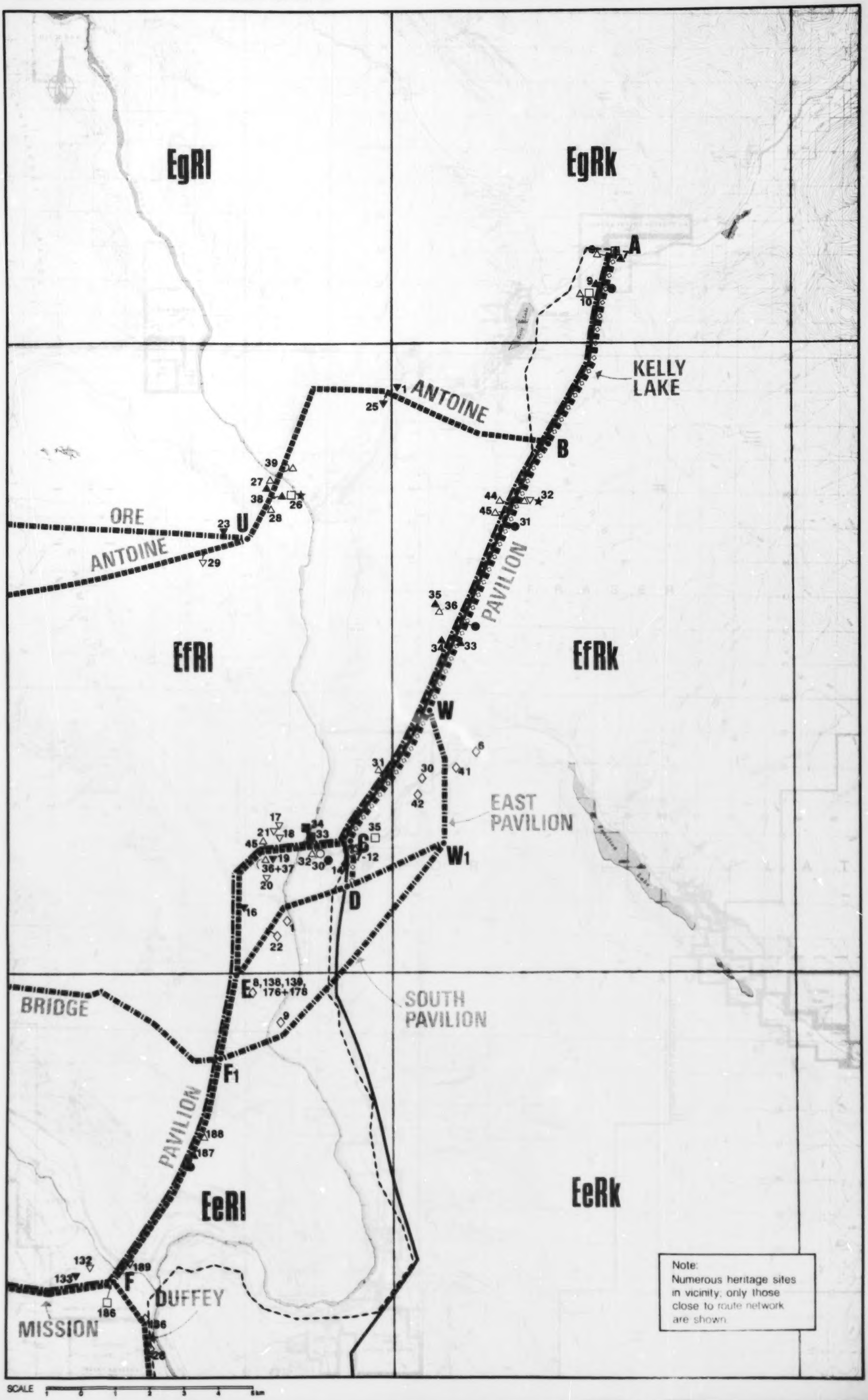
DkRt DkRs DkRr DkRq DkRp DkRo DkRn
STUDY AREA
ROUTE NETWORK

MAP SERIES VI
LEGEND
(Foldout) →

FRASER RIVER

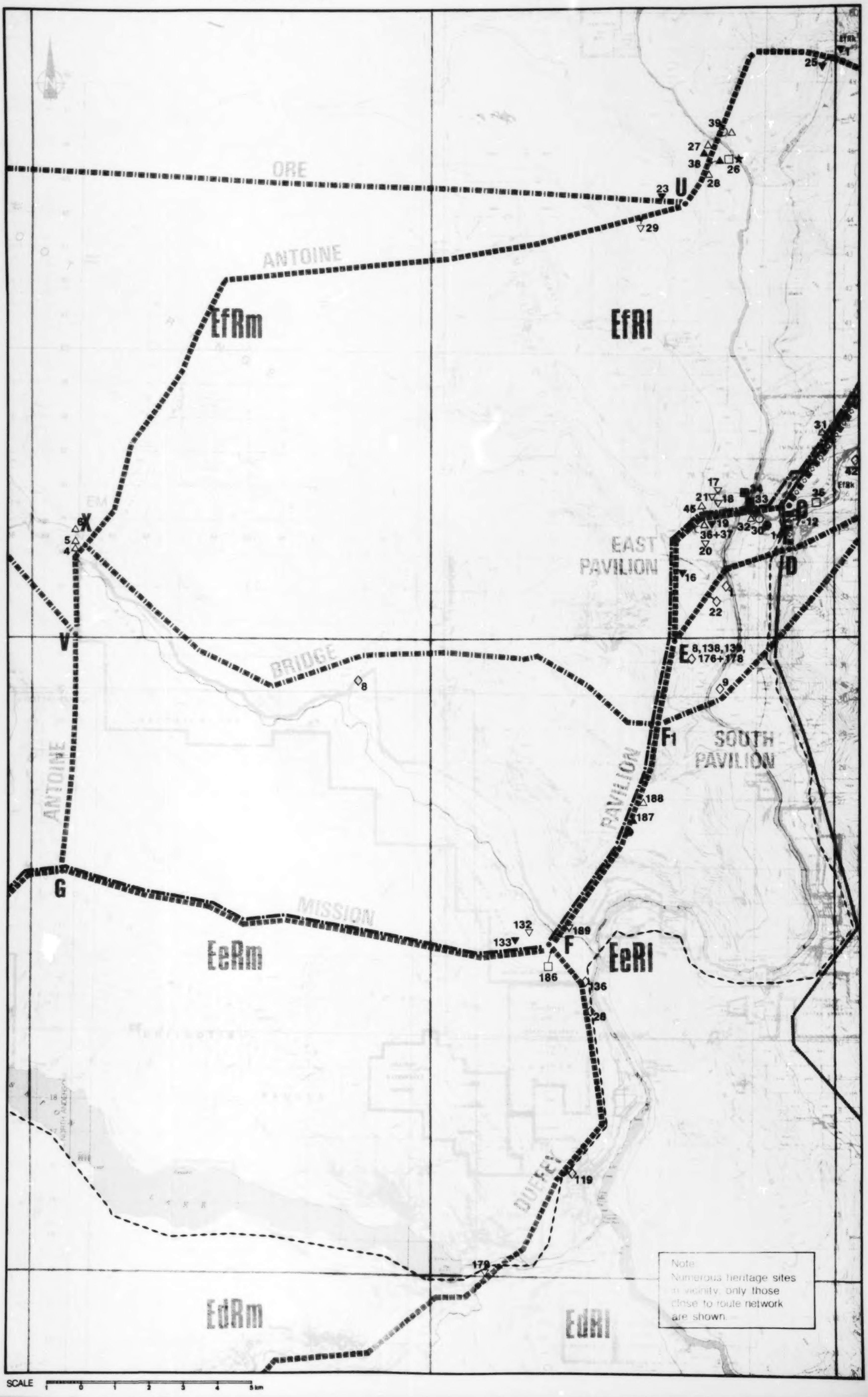
HERITAGE RESOURCES VI – 1 East



Note:
Numerous heritage sites in vicinity; only those close to route network are shown.

BRIDGE RIVER

HERITAGE RESOURCES



Note:
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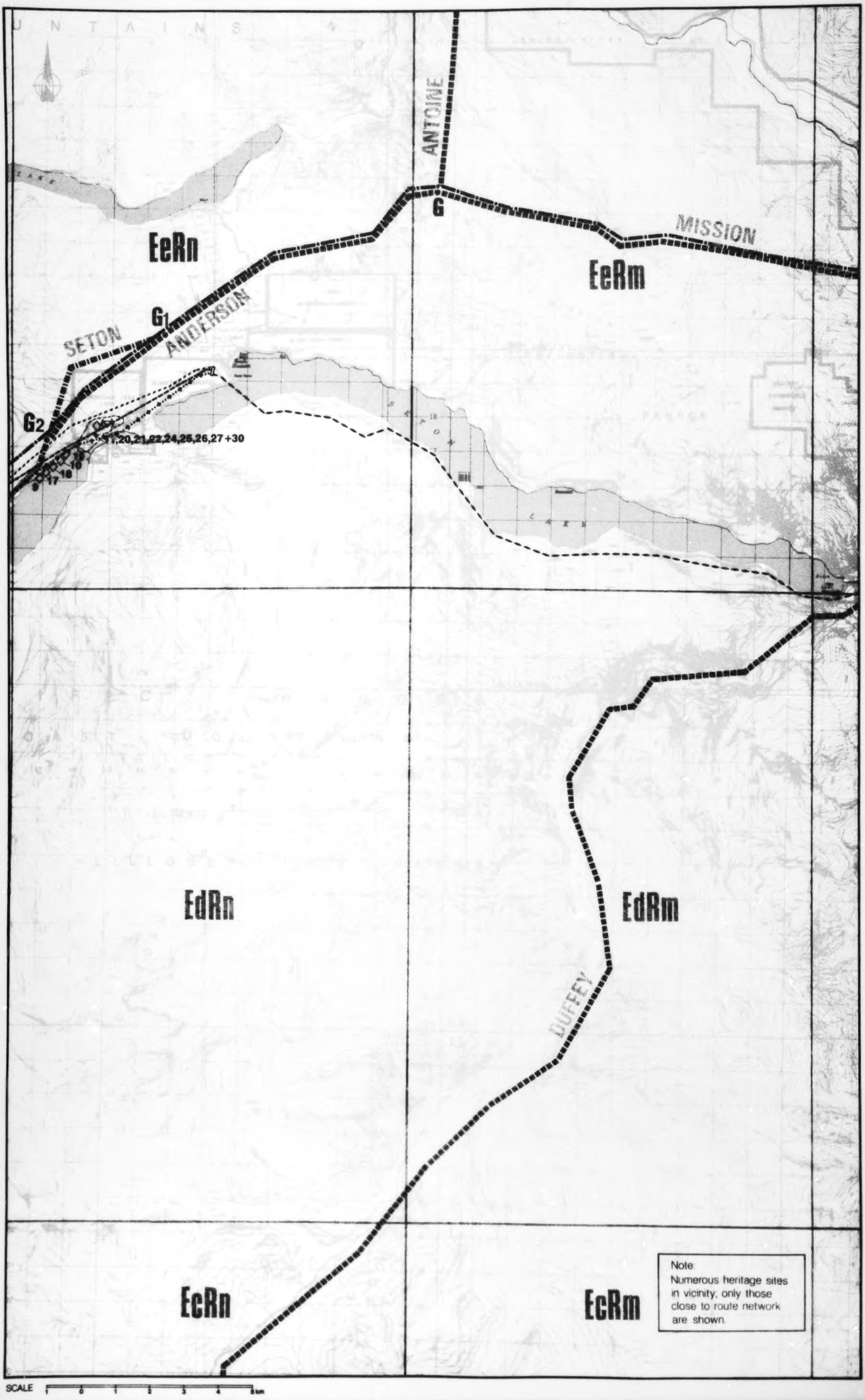
CAYOOSH

HERITAGE RESOURCES



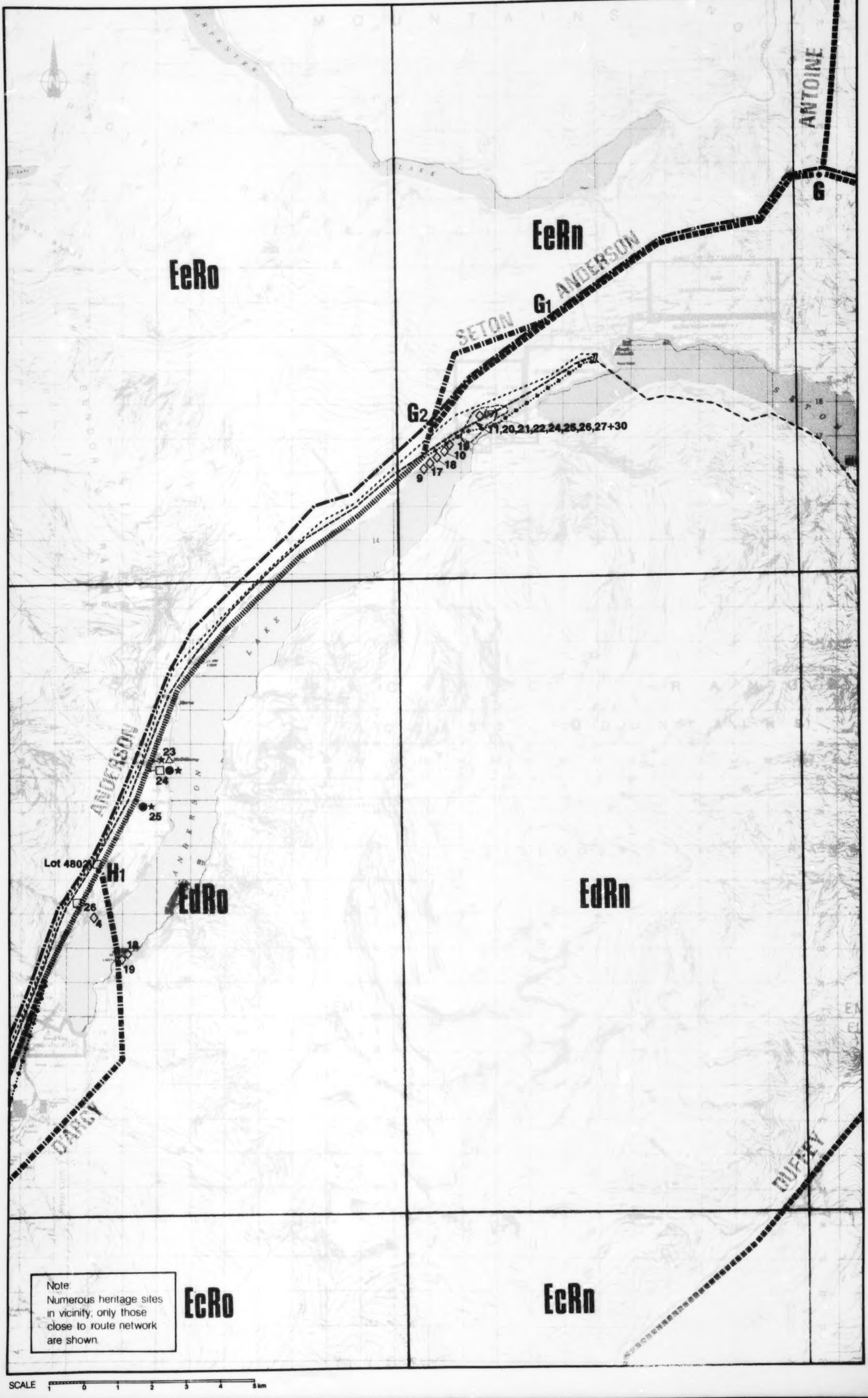
Note:
Numerous heritage sites in vicinity; only those close to route network are shown.

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

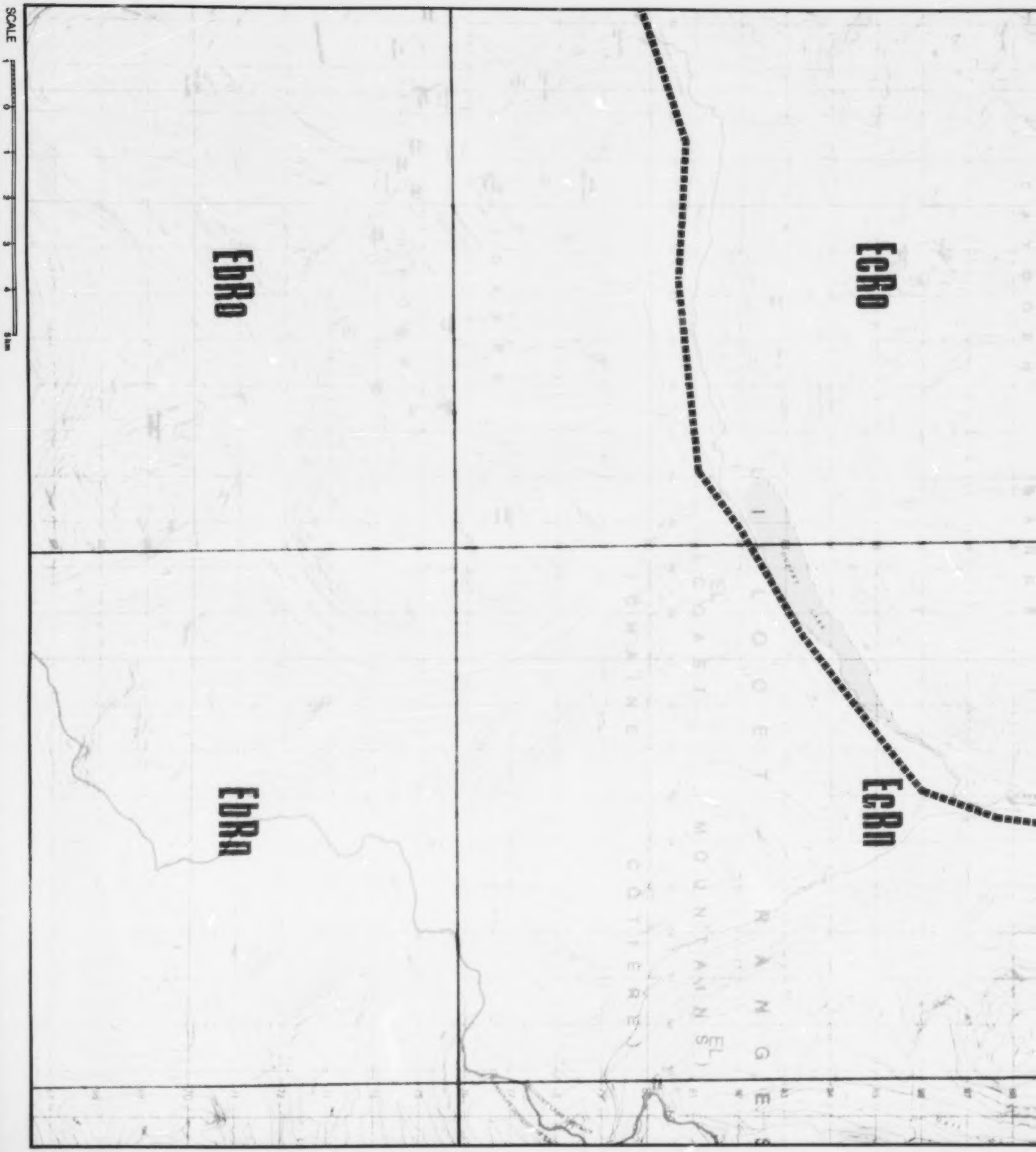
ANDERSON

HERITAGE RESOURCES

VI – 4 North



Note:
Numerous heritage sites in vicinity; only those close to route network are shown.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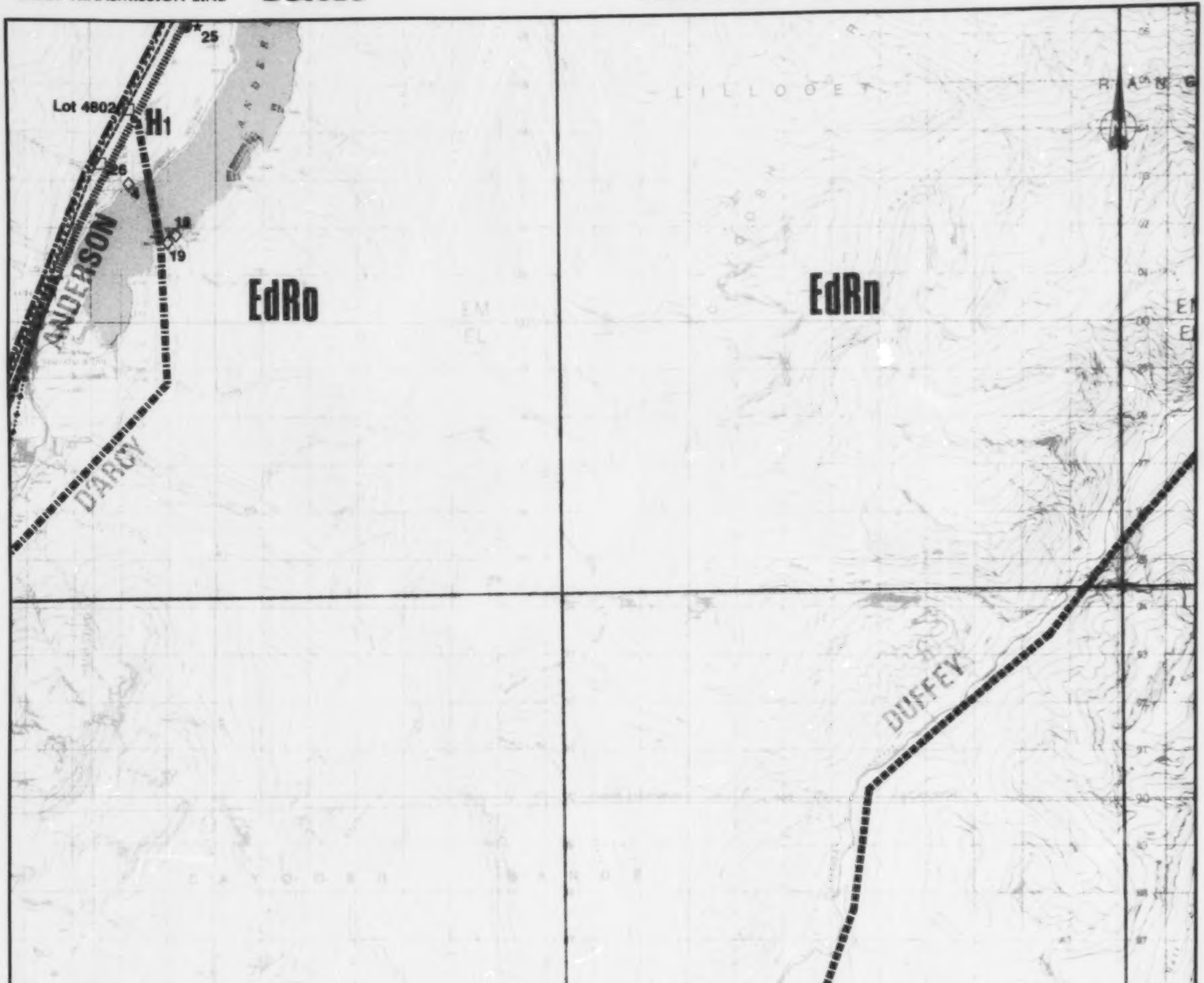
COAST MOUNTAINS
CHAINE COTIERE

KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

DUFFEY

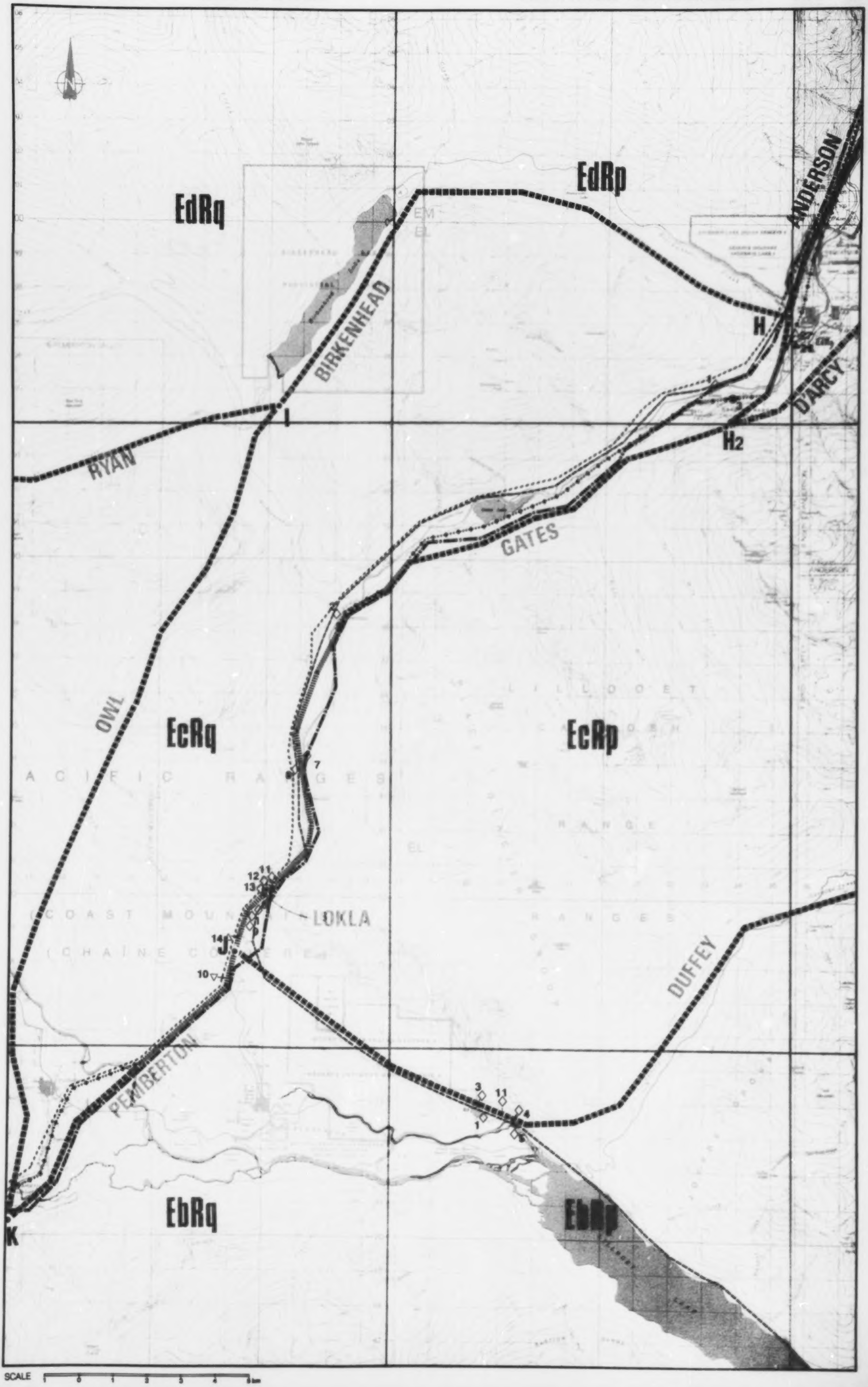
HERITAGE RESOURCES VI - 4 South



KELLY LAKE - CHEEKYE
500 kV TRANSMISSION LINE

GATES RIVER

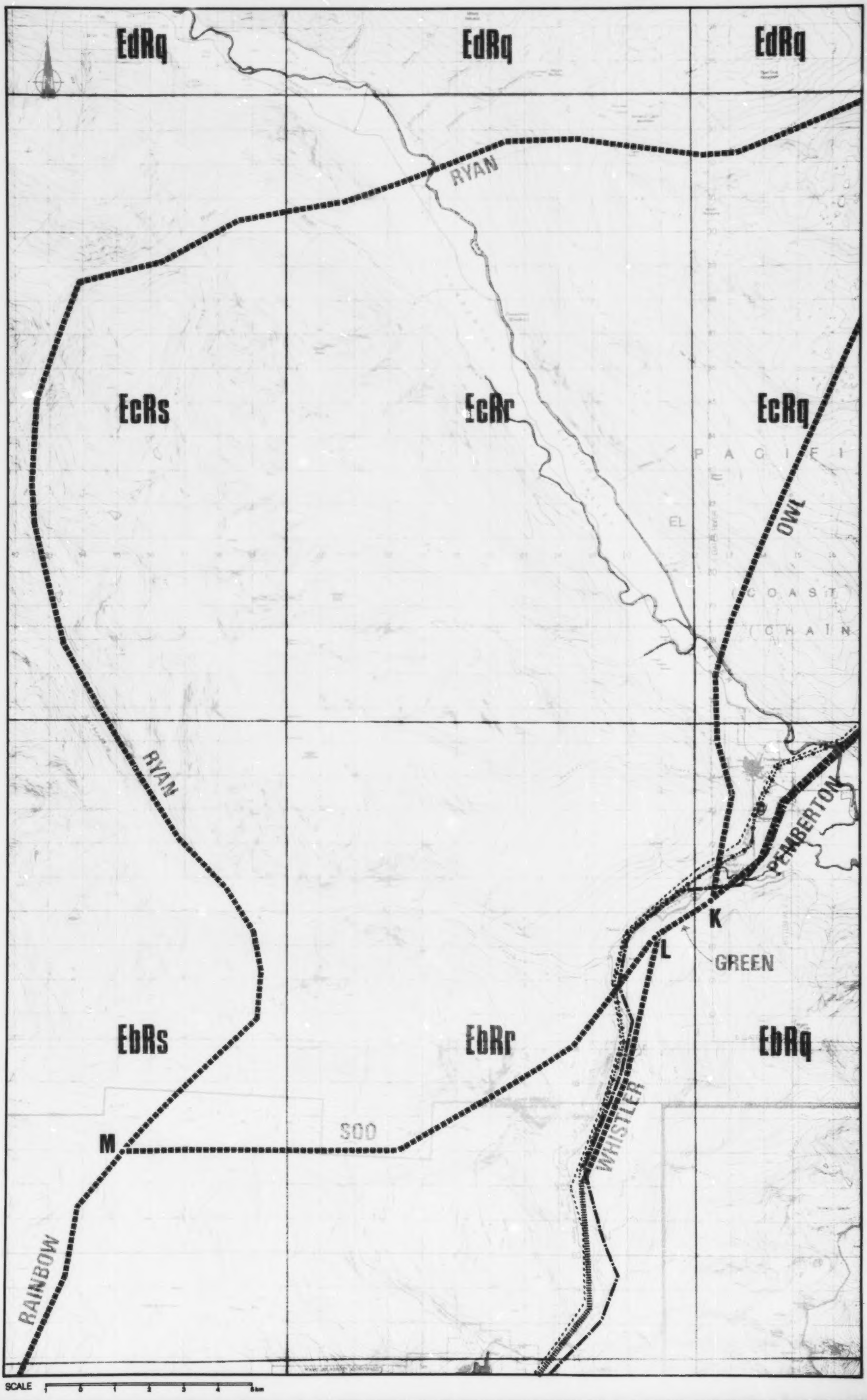
HERITAGE RESOURCES



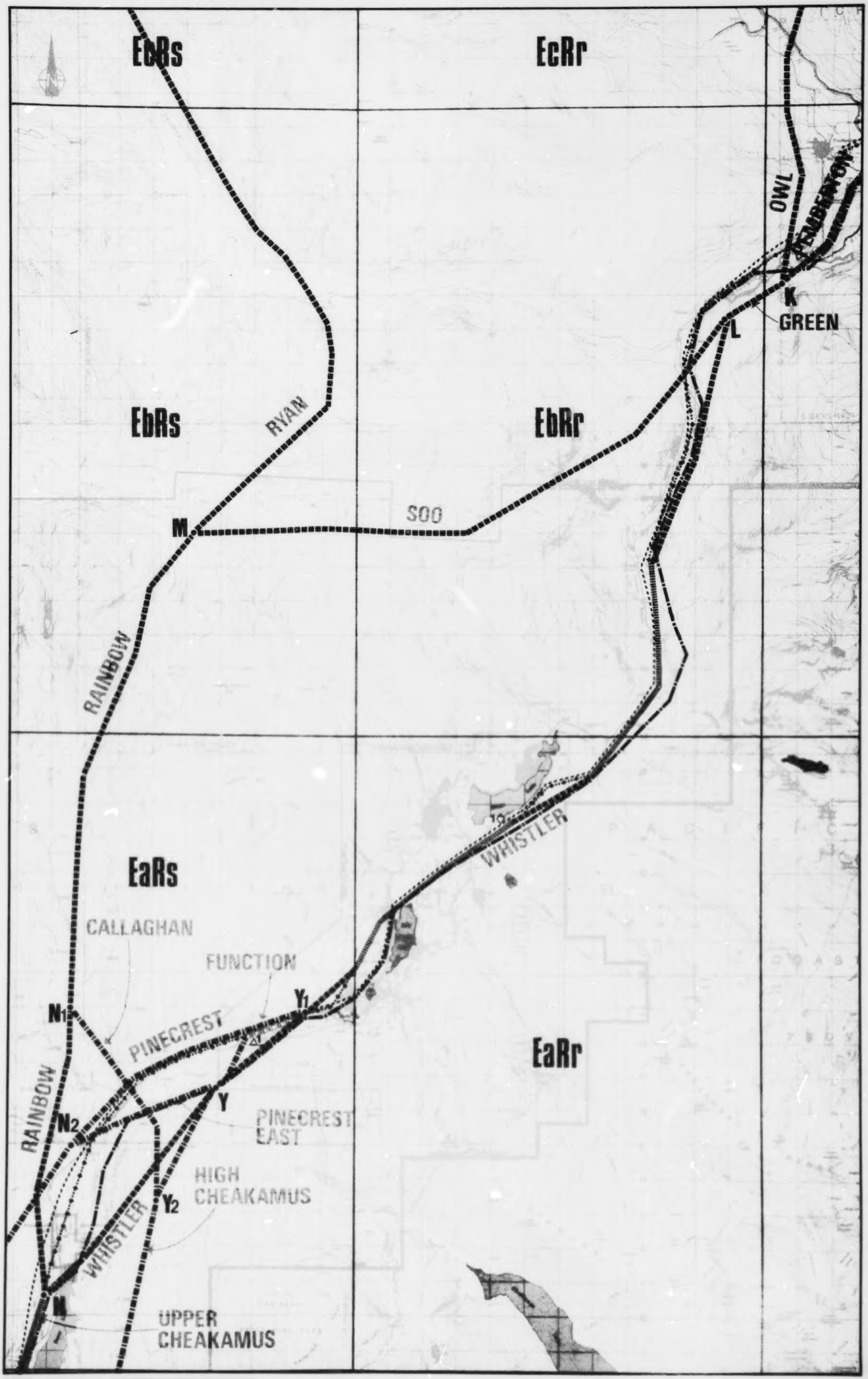
KELLY LAKE - CHEEKYE
500kV TRANSMISSION LINE

PEMBERTON VALLEY

HERITAGE RESOURCES VI - 8



WHISTLER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CALLAGHAN
FUNCTION
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PINECREST
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RAINBOW
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Y2
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UPPER CHEAKAMUS
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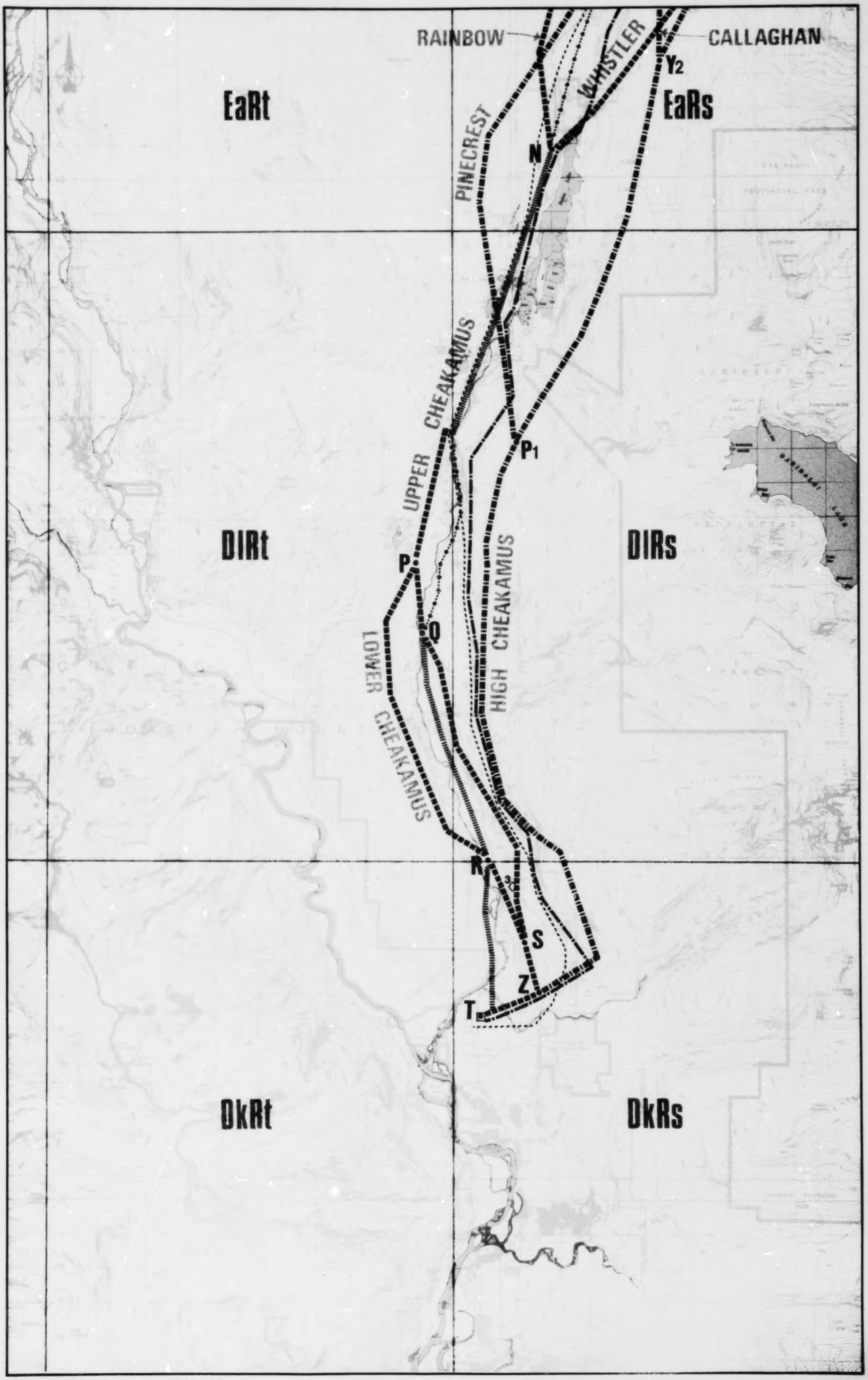
CHEAKAMUS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